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Small Shop Economies

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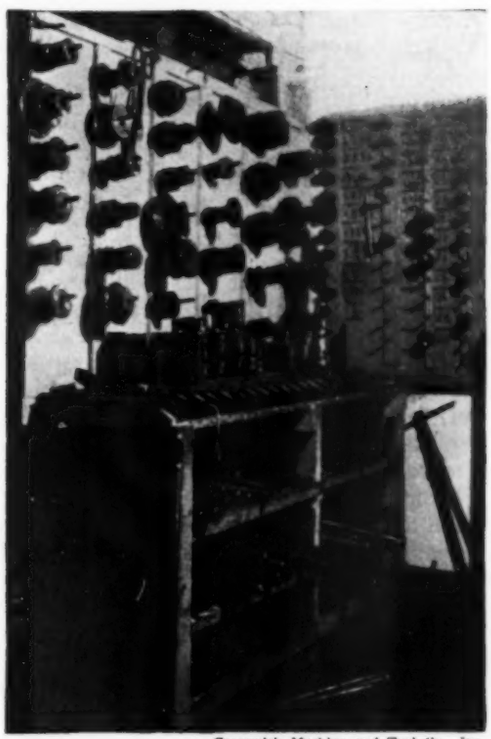
The United States may have an advantage in mass production and interchangeable assembly methods, but the small shop is the same the world over



Greenwich Machine and Tool Co., Inc.

MUCH has been written on the subject of production control in all its phases, but generally speaking, the articles have had reference to large factories with their many departments catering to every aspect of the output machine. While undoubtedly the modern tendency is towards large factories, yet at the same time in this country alone there are many thousands of small businesses designing, producing and selling different varieties of wares.

Quite frequently one finds that the manager of small or medium sized factories has taken over the appointment after previous experience as a shop superintendent, or technical superintendent to a large concern. It comes more or less natural to a man who has held a responsible position in a factory to develop ideas of his own on phases of the work other than those specifically under his control. Thus, he frequently takes the step of obtaining an appointment where his word is the law on every important question.

It is often said that it is much more difficult to control a small factory than a large one, and there is more than a modicum of truth in the statement. In a large factory the manager, sitting in his office, has merely to ask in order to obtain any fact on any question. In a small factory if he wants the time on any particular operation, he will probably have to go out in the shop and use a stop watch himself, because times are not recorded and few people are to be trusted to give unbiased reports.

It is quite possible for a purely theoretical or clerical man to make good as manager of a large factory, providing he possesses the necessary organizing ability. It is not even essential for him to be familiar with all phases of the work. He has specialists for each branch and may obtain any particular information he requires from them. By correlating the views of one with those of another he is able to come to a decision which is none the less useful because it was built on facts obtained from his staff. In a small factory, however, such a man would almost certainly be humbugged. In most cases it is almost absurd for a manager to ask one of his shop staff any practical questions if he is not perfectly conversant with the job himself. He must be in a position where he is able to look over the shoulder of an operator working at a turret lathe and then ask the foreman what the "X–Y–Z" he means by allowing an operator to use a tool like that.

The manager of a small factory must be a practical

man who knows the shop inside out and furthermore knows men.

When taking over the management of a factory, naturally the first thing that comes to one's mind is the product which is manufactured. A study of the catalogues of the company will give some idea of their normal lines, but generally speaking, small works are in the habit of doing almost any job that falls in their line or within the capacity of their machines. These "specials" always give trouble, as will be mentioned later. Quite frequently the new manager will be only slightly acquainted with the functions and characteristics of his new product. He will naturally be tempted to study it at as great a length as possible, but actually very little good will result from any such attitude. A knowledge of the use of any machines or components comes more by experience than by book work. Besides, generally speaking, a manager is not so greatly concerned with the nature of the functioning of his product as with the shop costs, output, and such like.

The Drafting Room

Probably the first department that will receive his attention is the drafting department, where most of the work should originate, but often does not. The drafting room of a small factory is a vastly different proposition from that of a large one. Three or four draftsmen under a chief, together with a girl tracer, usually constitute its personnel. The prime thing about this class of drawing office is its filing system. Is there one in existence? Probably some sort of system has been in vogue since the original formation of the company, but even so, it usually takes twenty minutes or so to find a drawing, so one of the early steps of the new manager would be to revise the filing system, splitting it preferably into two groups. One of these would contain all the drawings relative to the standard products of the company and the other would deal with any special work which necessitates re-drawing from the blueprints or sketches of the customer.

Next in importance is the question of a tool draftsman. From time to time special-purpose tools and small machines and fixtures will have to be designed. Often these are left to a tool maker or foreman in the shops, but this is not good policy, since it is far easier to lay a job out on paper and make corrections than scrap an amount of metal upon which many hours' work has been done. Every small drawing office should at least possess one member who has a fair knowledge of jig and tool design. Naturally, such draftsmen require greater remuneration than the average man graduated from a tracer, but they are always worth their money. It is sheer waste to ask a man who has no workshop experience to design shop tools.

Tracing is the next question. Are all the drawings traced? It is a somewhat surprising fact that many small companies possessing only a few draftsmen, go to the extent of tracing their drawings, no matter whether they be permanent or temporary. Obviously, the standard products of the company are of sufficient importance to be properly traced on linen so that any number of blueprints may be made and sent out by the sales department, but for special jobs and tool work where one or two prints at the most are required, ordinary detail paper is quite sufficient for the purpose. If the drawings are lined in heavily with, say, a 3H pencil they will print quite well.

Another important point in connection with a drafting room is the issue of blueprints to the shop. Sometimes these are sent out in bad condition. The writer remembers a particular case where standard blueprints were always being requisitioned by the foremen for the simple reason that they were never given a cardboard backing and were allowed to lie about in the shops, serving as a dumping place for components and occasionally serving the purpose of a wiping rag.

The final point requiring investigation in connection with the drafting room is that of checking. Whereas the large firms employ one or more draftsmen especially for the purpose of checking drawings, in the small concerns checking is often carried out in the most haphazard fashion. Elaborate drawings are sometimes allowed to go into the shop without any checking at all, although the draftsman signs his name doubly at the bottom as both draftsman and checker. No drawings should be allowed to leave any drafting room without adequate checking. Mistakes are, of course, bound to happen, but they should not be allowed to fall into the category of necessary evils. A mistake on a drawing should always be taken back to the draftsman who permitted it to pass his inspection.

Now suppose we take a look at the storeroom which frequently is the last department where efficiency is demanded. Quite clearly the stores of a factory are equivalent to the bank of a business concern, since they contain assets both in the way of finished parts and raw materials. Every stores department should have an index of some type or other by means of which it should be possible to produce at any time an exact inventory of the material within its walls. The usual method is by means of a card index system, but in a small factory this system, though excellent in itself, is apt to get very much out of date. A better method of tackling the question is to employ bin cards only for the components which are stocked in quantity. There is no reason for keeping track of temporary stock. These cards may take the usual form, with two columns for additions and subtractions, and must always be kept up to date. No part should be removed from the bins without adjustment being made on the card. The advantage of cards actually in the bins themselves as compared with cabinets of index cards is the fact that it is easy to make any alteration when the actual parts are being removed. When the card system is at the other end of the stores or sometimes in the main office the storekeeper or assistant is likely to depend on his memory or a scrap of paper for making the entries at the end of the day. Some days, because of pressure of work or shear forgetfulness, this alteration does not take place and so, day by day, the inventory of the stores gets further from the truth.

Tool Stores

Tool stores constitute another sore point with a small factory. Operators and machinists of all classes and types possess the faculty of acquisition almost to the verge of kleptomania. Every man seems to like to have as many tools as possible on his own bench or about his own machine. He cannot be blamed for this, for most of us will remember the delight with which we used up center punches and such like and stored them away in our kit boxes. Nevertheless, in any factory it is imperative that all tools not actually in use be kept in a properly regulated tool crib. Every tool issued to an operator should be accounted for by the usual form of check.

Cards to be signed serve well enough where special-purpose tools, such as jigs and fixtures, are concerned but they are far too elaborate with the ordinary range of standard small tools with which we are immediately concerned.

Another trouble associated with the tool storeroom is that it is likely to degenerate into a "lounger's paradise" where men stray to discuss the events of the day and the latest football and racing results. Such a condition must be stopped immediately. The door of the tool crib should always remain bolted and the ordinary work of the day carried out at the usual form of issuing counter.

To obtain a conscientious man to look after small tools is a difficult matter. Very often this is left to a boy or a laborer. This is really not good enough, but how otherwise can cost be kept within reasonable limits?

Grinding and Sharpening

In connection with small tools the question of grinding and sharpening arises. In large factories, practically all grinding of tools is carried out by one particular department, sometimes a branch of the tool room, but where only a few men are employed, they usually do their own grinding. In the opinion of the writer this is definitely wrong in 99 cases out of a 100, the exception being where the product is of such a nature that it cannot be classed as production work. We refer to the manufacture of certain types of scientific instruments where each particular job demands skill and individual adjustment of its own tools.

A useful experiment in this connection is to have the hours spent on tool grinding kept and totaled up for a week or so. The results are astonishing. For instance, the writer remembers in connection with a firm employing no more than 150 men, one-third of whom were employed on assembly work, that the combined hours supposed to have been spent on tool grinding amounted to the full time of three or four men. On top of this, four tool makers were employed constantly on repairs and small jigs and fixtures.

The fact of the matter is that tool grinding can always fill up a few odd minutes, and if operators are allowed to do their own grinding, one always finds two or three standing round the emery wheel, each waiting for the others. Failing this, they will be waiting for the forge to warm up or a cutting tool to cool down. It should be made a rule that no operator be allowed to do his own grinding. For grinding lathe tools and such simple tools, a boy may be trained to be more efficient than the operators themselves. A series of standard tools should be decided upon and drawn up. Simple form blocks will greatly assist the grinding with suitable templet gages for the finished job. The lathe tools may be issued either from the tool stores in the ordinary way with checks or, better still, be put under the immediate charge of a tool maker. The latter is better because a skilled tool maker will certainly object to misuse of cutting tools. It is a good plan to have the boy or apprentice in charge of grinding report direct to the tool maker during the mornings of the week. In this period he should be able to re-sharpen all the tools dulled during the previous day and at the same time grind some new ones. In the first days of making the change perhaps a longer time might be spent until a stock of standard tools is built up.

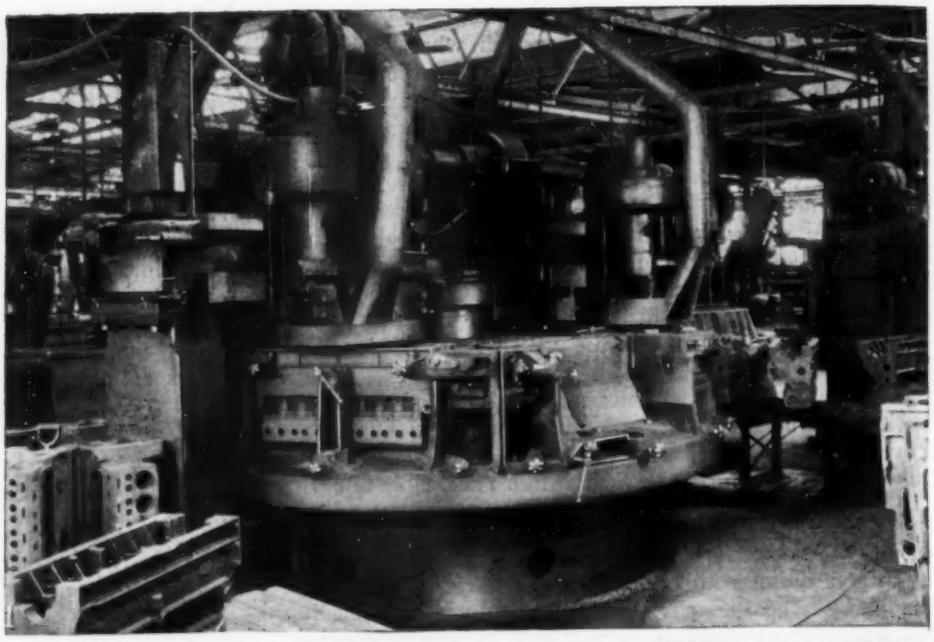
The hardening of tools in small shops is often carried out in a manner which can be described as nothing less than atrocious. Although pyrometer control is desirable it is usually out of the question from the point of view of cost. Frequently tools are heated in an open forge. This is by no means so bad a practice as some people would have us believe, provided it is carried out with the necessary skill and care. In the common way of hardening high-speed tool steel it is left to its own devices while operators stray about looking for a hammer or maybe even carrying on with their own work. Overheating is a bad fault in practically all heat treatments. Quenching, also, is rarely done properly. Most operators seem to be of the opinion that any oil will serve for quenching a tool. This is quite wrong. Sperm is the best medium for all-around purposes, but on account of its cost and objectionable features when used in an open shop, it may be replaced by any of the well known proprietary quenching oils now on the market. It is imperative that a large open drum or tank of oil be used. Often, so-called hardening is carried out in a small tin which, after the dipping of a single fairly heavy tool, heats to such an extent that any further tools never reach the hardened state.

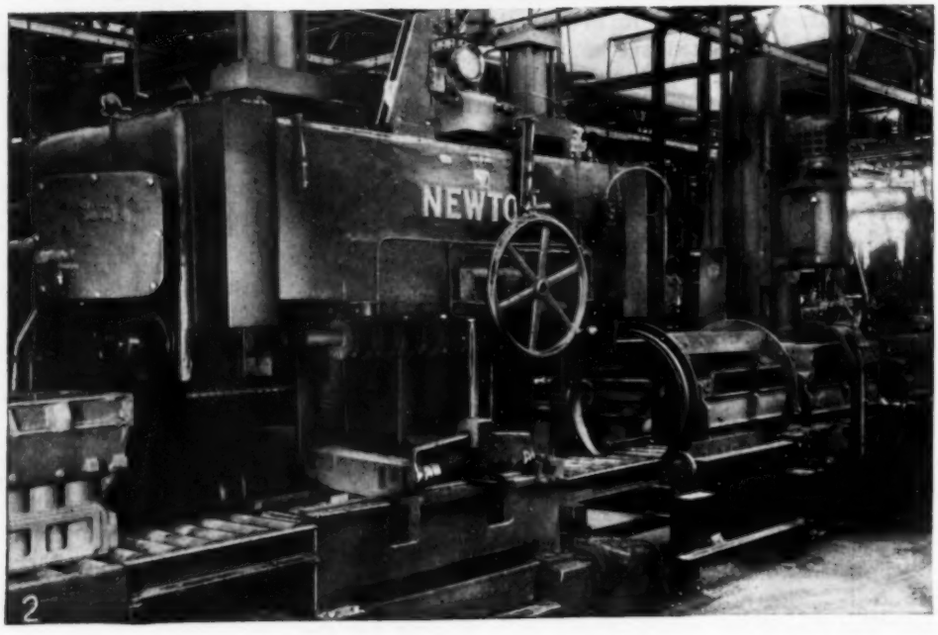
Reverting now to tool making itself, the small shop has one or two tool makers who carry on their work under the most difficult conditions. They are usually held up for want of machines which they have to borrow as best they may. It always pays to have a small lathe kept apart for use by the tool makers. A universal miller is perhaps even a better implement for the tool maker since its scope is almost unlimited. Frequently, the tool maker is called upon to prepare gages. This is all very well in its way, since he is the one man in the shop qualified for the work. Nevertheless, no matter how skilled a mechanic he may be, he cannot possibly prepare gages fit for shop use without adequate tools and measuring instruments. The ordinary micrometer is not sufficiently accurate or constant to form the standard for gage work. A small set of block or slip gages is essential. If screw gages are to be made, a projector of some type is usually demanded. This is an expensive item and takes up quite a large amount of room. A better way out for the small shop is one of the calibrated optical microscopes now on the market.

Press Tools

Even the smallest of shops has nowadays to make use of press tools, and in this connection economies can usually be effected. It is quite a common occurrence, when going through the shop, to find a setter at work on a press turning out blanks which a boy could do equally well, if not better. Such a condition is not to be tolerated. One of the prime reasons why the press tool is such an admirable instrument of manufacture lies in the fact that it can be operated by unskilled labor. Unless the run be limited to a very few parts, the setter should not be allowed to make the run himself. He may be better employed on more skilled duties in other parts of the shop. While on this particular phase of the subject, the writer would like to call attention to the value of kick presses for manufacture and assembly purposes in the small shop. They are almost invaluable since they permit the use of both hands. Remember, however, the danger of totally unskilled operators sustaining damage to their hands unless there is a guard.

To be concluded next week.





The adaptation of standard equipment to special work, together with a carefully planned material handling layout, contributes to economic quality production on the Chrysler Imperial Eight motor

A New Line on Cylinder Blocks

A PRODUCTION set-up, which makes it possible for two men to handle 43 operations, including most of the major machine work on eight-cylinder engine blocks, is well worth study even in an industry where labor per piece has been reduced constantly. Small wonder then, that this particular Imperial line in Chrysler's newly equipped machine shop at its Jefferson Avenue plant is attracting attention.

Several noteworthy features characterize the layout. Although most of the machines have multiple spindles, they are nearly all standard rather than special purpose. Consequently, they are readily adaptable to other work in the event of engineering changes. Most of the machines do only one-way work; a large majority have hydraulic feeds. Most of the machines are arranged to stop automatically and to return to their

To be concluded next week

[1] The start: An air hoist on a small I-beam crane lifts the blocks to an Ingersoll rotary mill where the bottom face is finished. One man operates this machine and the two adjacent to it

[2] Turning the handwheel raises the block on a link-supported platform and clamps it against the head of the machine. Hydraulically fed cutters mill the ends of all main bearings. After being inverted, the block is drilled and reamed for the breather hole in the Barnes machine shown at the right

[3] The front end of the block is roughed and finished in a Newton side miller with two heads. An air lift lowers and raises the work to and from the main conveyor. Pneumatic clamps are used during the cut

[4] A three-spindle machine mills the top of the block and the two bosses on the side of the block. This is a good example of how the conveyor runs up to the machine at both sides. Throwing a lever drops the block on locating strips and dowels

[5] The manifold and water jacket sides are finished in a Putnam horizontal miller. For this and many other milling operations, Stellite tipped cutters are used

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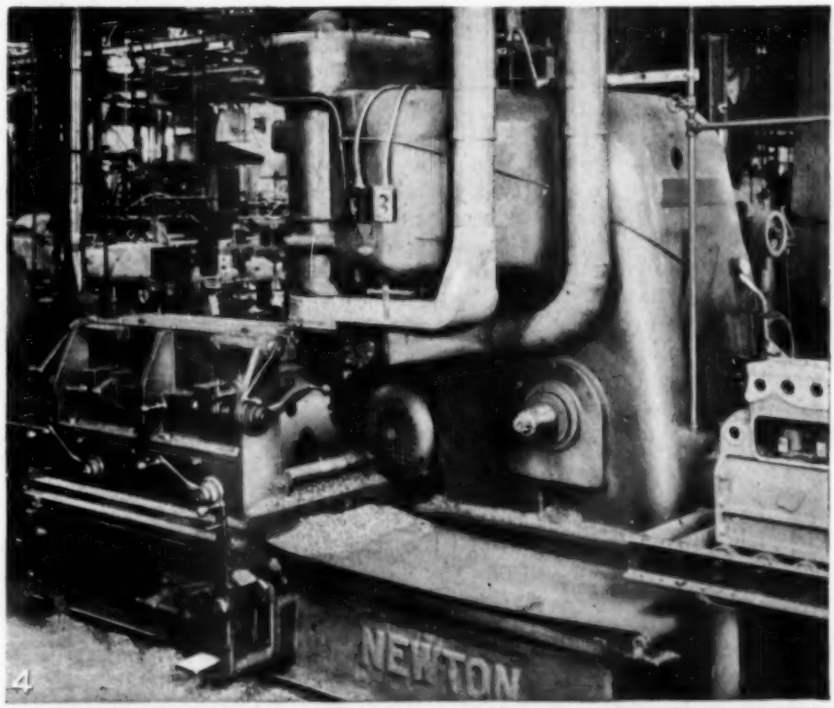
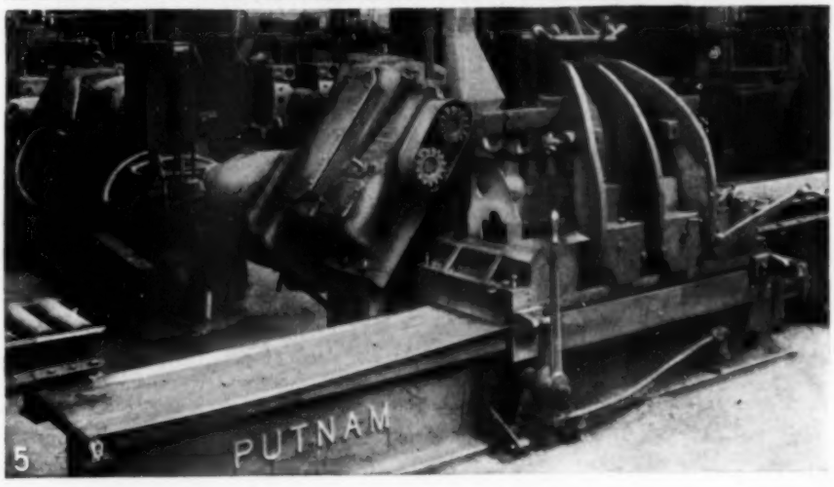
loading positions upon completion of the cutting stroke. Finally, the line is so arranged that virtually no manual lifting is required; where the block must be inverted, easily operated turnovers are provided. With one exception, all operations are performed with the block resting either upon its top or bottom face. Where a few holes must be drilled at an angle, the tool rather than the block is tilted.

Almost from start to finish, the cylinder block travels along a level roller conveyor 25 in. above the floor. A short section of the conveyor is built into most of the machines and is so arranged that it can be dropped a fraction of an inch to rest the work on locating pads while machining is in progress. This plan involves arranging the machines at a uniform bed height. Where this cannot be done, air hoists on trolleys are provided to lift the block off the conveyor and to drop it into place on the machine.

Vertical machines are arranged with their heads directly over the conveyor; most horizontal machines are placed inside the conveyor with spindles at right angles to the line. So far as possible, the blocks are kept with their long axes parallel to the conveyor, but for end machining and for operations in which the tools must enter from the end, the blocks are swung about on short roller sections at right angles to the line without lifting. Many of the tunnel fixtures used bridge over the conveyor, but other fixtures have open sides. Quick-acting locking devices, pneumatic or mechanical, are used wherever possible.





The Foreman's Round Table

Advice, Gratis

"AL, do you ever accept advice?" asked Ed as the two friends were walking home.

"Yes," replied Al, "but not in place of pay. I worked with a very generous man once. He paid the office boy $125 a month—one hundred in advice, and twenty-five cash. But me, I want mine all cash."

"Well then, do you ever give advice?"

"Never. My wife attends to that. Why do you ask?"

"Well, I've got some good boys in my department. They are country boys and smart as whips. I can't shove them along because they have trouble reading blueprints and working out the dimensions from them. Two of them quit school too early. The other one is better educated, but he is shy on mathematics. I thought maybe I could get these kids up to a point where I could shove them ahead when business opens up, but some way I have an idea they don't appreciate my advice."

"That's a wise conclusion, Ed. Advice is the freest thing what is. Everybody offers it, nobody takes it. I've been through the same thing you are talking about. In one place I worked I had charge of the toolroom, and I got interested in some of the young fellows I had hired. I'd explain the why and wherefore of die design and explain how trigonometry was useful in laying out dies. I showed them how plane geometry and layout were the same thing, and how useful algebra was."

"Did it work out all right, or not?"

"Oh, same as usual. I overheard them talking one day—they did not know I was around—and what they said about me and my advice was certainly not complimentary. They seemed to think I was stringing them along to get them interested in mathematics, and then get some money out of them by offering to teach them. I dumped those guys, but the habit persisted."

"Didn't know enough to quit, eh?"

"No, but after getting stung a couple more times I came to the conclusion that either I didn't have the ability to penetrate their minds or that people don't want advice which conflicts with their desires. I think you will find the same thing, Ed."

"I do now, so I guess you're right, Al. I've never received a single piece of advice from my wife that wasn't contrary to what I wanted to do."

"You're not alone in that, son. A guy named Tam O'Shanter had the same experience. Says he:

> 'Ah gentle dames it gars me greet,
> To think how many counsels sweet,
> How many lengthened sage advices,
> The husband from the wife despises'."

"Huh. My wife is Scotch so I'm personally acquainted with that guy. My wife even pretends to find a resemblance between us two. But what did you do about the boys, Al, quit advising them?"

"Yes, I went to a couple of friends who are executives and asked them how they handled such things. They told me that they never gave advice, because it was misunderstood. So, while I am willing to encourage a fellow if it seems to be wanted, I never advise him what to do to get ahead. I may think I know, but I don't believe the other fellow wants me to tell him."

"What would you say to him?"

"I'd say, 'Brother, you'll have to work,' and he don't want to hear it."

"I guess I'll quit too. That's the only kind of advice I ever get, and if other people hate it as bad as I do, I don't wonder those boys get very busy when they see me coming."

Do people get tired of persistent advice givers, or do they naturally resist advice that counsels effort? Is it better to abstain from offering advice, and can such abstinence be construed as indifference?

Contributed by James K. Matter.

Discussion of Former Topics

Who Pays the Bills?

Looking at the matter from a business-like viewpoint, it would seem justifiable to hold a man responsible and make him pay for tools he has drawn out on checks and for which he is unable to account. Let us not forget, however, that the circumstances under which he is working might be just as responsible for the loss of tools as is his own negligence. Habitual losers should be penalized strictly, but one such offense should be excused.

A man is given a specified number of tool checks. A check is placed on every tool he draws out, and upon termination of connections with the company, he is required to render a signed release from tool liabilities before final payment is made. If he is further required to account for his checks at least once a week, reporting any discrepancy immediately, the plan should prove effective and tool losses should be reduced. —GEORGE BELBES.

Wide Open

After being accustomed to the open type of foreman's office, one can best be impressed with the loss of efficiency caused by the use of the "rabbit-hutch" office. From the men's point of view the foreman is not easily accessible on those occasions when a short question and answer is all the contact requires. On the other hand, the foreman may be in consultation on an intricate problem, and several operations in the shop may be stopped for the want of his decisions. With the open office a foreman would be aware of any man coming up to his desk and a word spoken over the desk rail would be easy and natural.

As to the relative location of the office in the shop, I think that this should be chosen so that the foreman is centrally placed having regard to all his duties, their relative importance and demands upon his time. I doubt if there is any advantage to be gained by choosing the office location solely on a basis of disciplinary effect. It certainly can be contended that better discipline is obtainable face to face than otherwise.

In a large machine shop on simple mass production where a foreman may have one or more assistants, there is much to be said in favor of building the office over the tool store. The elevation gives the foreman a view over the shop very much as the captain has from the bridge of a ship.

—S. A. KNIGHT,
Irak Petroleum Company,
Tuz Khurmatu, Irak.

The End of the Road

It is said that each British soldier carries a field-marshal's baton in his knapsack. The efficiency of the army is answer enough that this incentive has created no ill feeling, for each man knows his advancement depends upon his own ability.

Apply this to business and you give the men an interest in their work and the feeling that the sky is the limit. Each man knows his limitations and if he feels the urge will prepare for the opportunity. Good men will be contented to stick and give their best, knowing they are appreciated. Foremen should designate who shall move up, and to prevent bitterness in passing over long service men, should let it be clearly understood that the one appointed must make good or quit, because his old job will be filled immediately.

—R. D. ALLEN,
North Sydney, Australia.

The Deadline

Why not remove some of the sting from the "deadline" by closing the plant for two weeks in July or August, and using this time for necessary repairs, painting, etc? The men performing the work can be granted their leave either before or after the closedown.

Regardless of whether the work is mental or manual a change of occupation and scene is necessary to broaden and give the worker a new outlook on life.

Employees who have been with the firm one year should receive one week's vacation with pay; all over two years, two weeks' vacation.

—A. TOMLINSON.

On Again, Off Again

It is unfair to penalize the ambitious, but other factors besides the urge to get on may cause a man to quit. Domestic pressure is one of them. There are bound to be some who return like the prodigal son, but instead of feasting on the fatted calf, many of them, under the blanket rule, might be forced to eat the crust of charity.

A good workman gains by fresh contacts. He has seen yet another corner of the world and that never did anybody any harm. If he made a mistake in quitting and recognizes it, he will generally be fare more settled afterwards than if unrealized ambition had kept gnawing at his vitals.

The foreman's prejudice against re-hiring a quitter is an undignified show of touched vanity. Apart from anything else, preference should be given to a man already experienced in the job he is going to, over a new man.

—J. TRICKETT, *Lancashire, England.*

The Stork's Assistant

There are very few companies, up to the present day, that have adopted compulsory medical examination in their work. Many have talked about it, but few have realized the benefit derived from it.

What could be more beneficial to a company than to have all healthy employees? It is common knowledge that when one is robust and well one can work quicker and better. Obviously, there would be less disorganization in production, as illness would be practically eliminated.

Under the National Insurance scheme in England employees are entitled to choose any doctor in their district, from whom they can receive treatment if required. But unfortu-

nately one finds that they do not all take advantage of this. Some will not go until they are compelled to, and then perhaps it is too late. On the other hand, if medical examination were made compulsory, diseases and complaints would be discovered in their early stages and in many cases would be checked.

If medical examination and treatment were made compulsory in all works, there is no doubt that the health of the employees would be improved, and a nation of healthy workpeople are prepared to tackle any problem placed before them.

—T. R. SILVER,
Edgbaston, Birmingham, England.

Wide Open

The foreman's office should be near the entrance to the department, have free access to the open air and be well lighted. The foreman should have a certain amount of privacy, which certainly could not be the case if the office were open to the department.

A foreman gets leg-weary and brain-weary and seeks repose in his office to recover and collect his scattered thoughts. If he is in full view of the shop and apparently doing nothing, the psychological effect is that men think he is really doing nothing.

It would not be unreasonable to suppose that Williams occasionally sits and indulges in a few seconds mediation in his office and perhaps a little siesta, especially after lunch, but it is doubtful if he would like it to be known to his subordinates. He should picture himself in the foreman's office exposed to the gaze of the shop and then ask himself whether offices should be open to the shop or not.

—W. J. HOPGOOD, *London, England.*

Gilding the Lily

Many years ago, when working at Halifax, England, I came in touch with just the same type of mechanic as Al. The firm was extending and bought many American machine tools; with these there came a young man who had, so he said, American experience.

The whole shop had the shock of their lives, for he brought with him a large wooden trunk about the size of a seaman's chest chock full of the finest tools we had ever seen, not only one of a kind, but several. It seemed to us that it would have taken the combined catalogues of Starrett and Brown & Sharpe to have listed them. This young man was the best salesman these two famous firms had. His stock was soon cut down, leaving only a few for his own use.

But his tool kit did that shop a world of good. Solid calipers gave way to spring calipers, unadjustable scribing blocks to those where the points could be set without tapping. But I am sorry to say, for he was a real good chap, that he could not hold his job. The tools in this case did not make the good mechanic, for he could not compete with the men trained in the shop with their home made tools. He left us on Saturday, and on Monday his lathe was run by a new man.

Not a single tool of any kind did the new man bring with him. His excuse was that he had put them in pawn to pay for his board at the last place. How did he manage it? Well, he borrowed my foot rule, then several lengths of $\frac{1}{4}$ in. wire. The job he was doing needed a pair of 12 in. inside calipers. He cut off a length of wire, filed the ends to a radius, next bent another length into a circle bending the ends inward, filed these to fit the straight wire and proceeded to do the job. He did it in better time than the man with the tool kit ever could have done. He stayed with us about 6 months, then the roving spirit come over him. He left without notice, losing half a week's wages. The tools he took away with him were my 2-foot rule, one pair of large outside calipers, both of which I had given him. We were sorry to lose him because he was the best turner I had ever worked with, and I have no doubt could have stayed with the firm for years.

Here then were two men, both likable in themselves, one with more tools than he knew how to use, the other making his tools as he wanted them. And the no tool man held his job.

I asked the young man from America how he came to have such a stock of tools. His explanation was this: When you got a start in a shop, nine times out of ten, the foreman was running a tool club into which you paid so much per week. You joined it even if you did not require tools, for a foreman in America was a foreman, and of course you bought tools for this reason. I could hardly believe him but his kit told its own tale. I remembered all this when I became foreman, and got one of the men to take up this tool agent job, which he did, and now all my men have a real good set of tools which I can assure you they know how to use. When the apprentices start to work they join this club paying a small sum weekly so that by the time they are 21 they have real good tool kits, without feeling the cost.

—T. SMITH, *England.*

Bad Debts

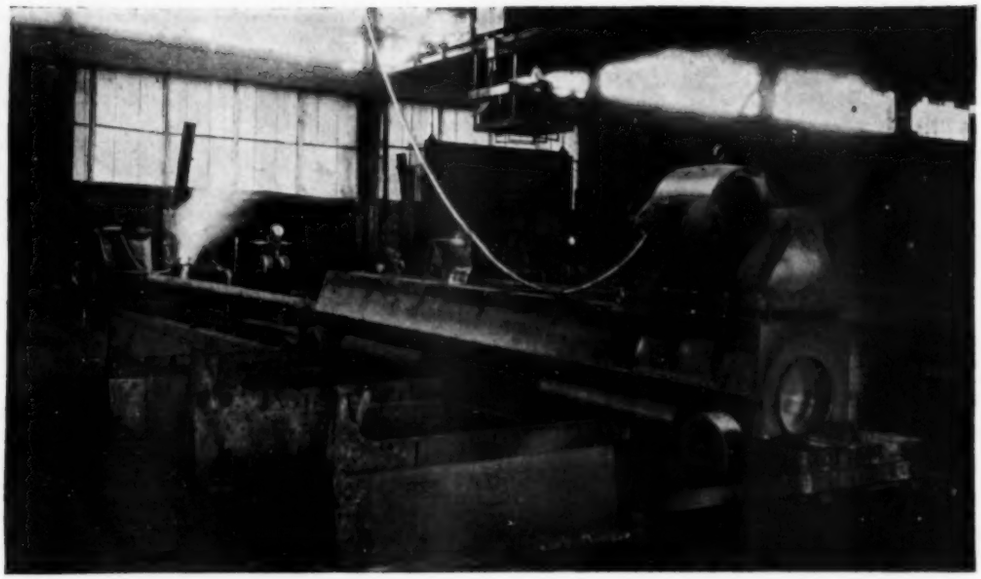
There is a side to the debt question that many employees fail to consider. The name of the company where a man is employed is the basis upon which credit is granted him. Employers are often asked regarding their employee's financial responsibility before credit is extended. The employer, therefore, feels personally responsible in the event that such obligations are not properly paid.

Employers know that their best employees are the ones who handle their own finances properly and who are not worried about unpaid bills.

Garnishments are inconvenient to the employer and embarrassing to the employee. They are often the result of disagreements and disputes. Therefore, our company has an arrangement with the local Judges that no garnishments be issued on our employees without being first referred to the company. This gives the company an opportunity to investigate and to assist employees in adjusting any differences. Often a more favorable adjustment for the employee is obtained which impresses him with the company's interest.

This plan has given excellent results. While the company does not act as a collection agency, the men know that they are expected to take care of their obligations upon a reasonable and fair basis. It has resulted in no garnishments being issued for a long time and practically no inquiries on employees for several months. The employees have a fine reputation for paying their obligations in a satisfactory manner.

—A. L. JONES, *Office Manager, Armstrong Machine Works.*



Present-day 18-ft. deLavaud pipe casting machine

Casting Pipe Centrifugally

S. B. CLARK
Research Engineer
U. S. Pipe & Foundry Company

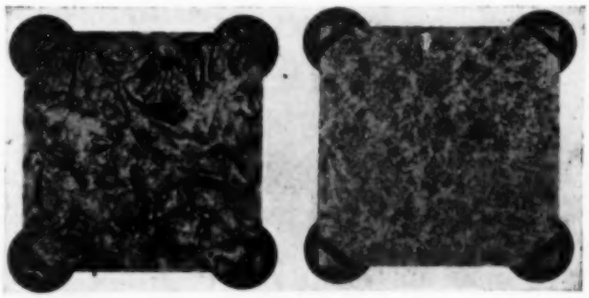
THE deLavaud process, by which pipe is cast centrifugally, introduces molten iron into a cylindrical metal mold inclined slightly to the horizontal, completely enveloped by hot water and rotating at a comparatively high velocity. Iron is fed into the mold through a trough having at its lower end a curved spout. The trough is supplied with iron by a small ladle of sufficient capacity to make one pipe. This ladle is so designed that when moved about its pivot, a constant, uniform delivery of iron to the trough is maintained.

When the mold is in position for casting, the trough extends down the barrel for nearly its full length. The bell end of the pipe is first cast and the mold is then moved uniformly down the bed away from the spout. The stream of iron, discharging from the spout, flows tangentially to the surface of the mold, where it is held in place by centrifugal force, thus forming a homogeneous pipe.

After the pipe is extracted from the mold, an operation facilitated by the expansion of the mold and the shrinkage of the pipe, it is taken while still hot to the annealing furnace. Here it is annealed at temperatures approximating 1,700 deg. F. This heat-treatment eliminates the slight surface chill by transformation of the carbon from a combined to a graphitic form and insures removal of the casting strains.

In 1914, Dimitri Sensaud deLavaud, a Brazilian, started experiments using a permanent cast-iron mold. His first successful machine (1915) incorporated a water-cooled mold, the iron being led into a refractory lined trough which when filled with the required amount of iron was dumped sidewise through an arc of 180 deg. Ten pipe of 6 to 10-in. diameter and 10 ft. long could be produced hourly. The next year deLavaud came to the United States and built a small 4-in. exhibition machine at Buffalo. Gordon Perry, seeing the machine, took Canadian rights and soon thereafter built a machine at Toronto.

Early experiments at Toronto were extremely discouraging. Continued trouble was experienced in endeavoring to make pipe with the side-dumping trough, and further difficulties resulted from the binding of the revolving mold in its bearings. During the next two



Microstructure of a sand-cast pipe (left) and a deLavaud pipe, which has a tensile strength of 30-35,000 lb. per sq.in., a modulus of rupture of 50-60,000, a modulus of elasticity of 10,000,000 to 13,000,000, and a Shore hardness number of 30

Abstracted from a paper, "Cast-Iron Pipe Produced Centrifugally by the deLavaud Process," presented recently before the A.S.S.T.

years, the trough was replaced by a water-cooled runner and the mold was altered to move in relation to the trough, the iron being deposited progressively on the mold surface. The mold was completely immersed in water, and the present method of mold support and water seal was adopted. These changes resulted in a machine fundamentally like those made today.

In 1921, the U. S. Pipe & Foundry Company acquired sole rights for the manufacture of deLavaud pipe in the United States. Soon thereafter the National Cast Iron Pipe Company was sub-licensed. Within the next year, a new plant will be completed at Coshocton, Ohio, by the J. B. Clow & Sons Company, also operating on a sub-license.

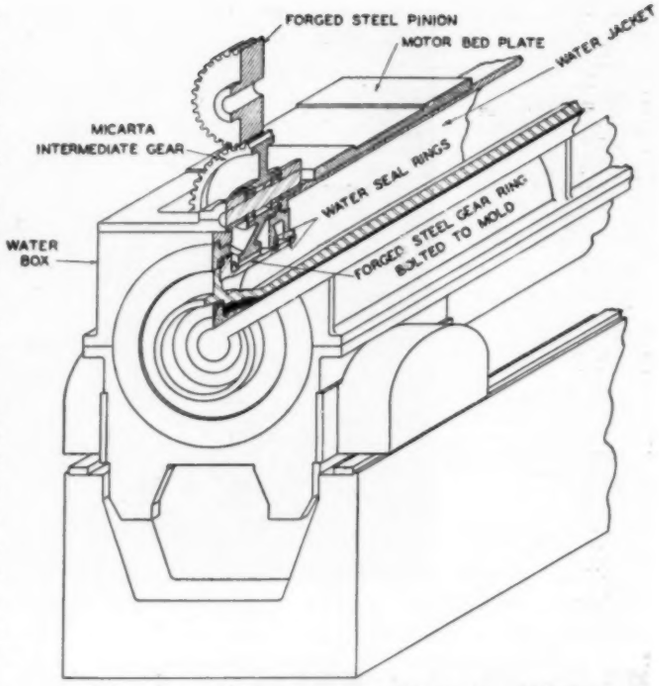
Until the latter part of 1922, deLavaud pipe had been produced on a relatively small commercial scale, but the capacity of the machines was gradually enlarged and the rate of cast trebled. In 1921, a machine casting ten to fifteen 6-in. pipe 12 ft. long per hour was considered to be operating satisfactorily; by 1926 a 6-in. machine was averaging 400 pipe per 10-hour day, a tonnage equivalent to or greater than the largest single-pit cast installation. In 1925 a machine having a capacity of 14- to 20-in. pipe in 12-ft. lengths was installed at Birmingham, and in 1928 a battery of machines to make pipe up to 12-in. diameter in 18-ft. lengths. Today, 24-in. pipe is being produced satisfactorily, and a unit for making 4- to 24-in. pipe in 18-ft. lengths will soon be in operation.

Molds are made from hollow steel forgings carefully heat-treated and machined to a tolerance of 0.003 in. Earlier molds were made from a nickel-chromium composition, but it was found that much improved life could be obtained with a chrome-molybdenum steel. Mold failure generally occurs because of the breaking down of the bore. Fire checks and cracks eventually develop of sufficient depth to impede proper withdrawal of the pipe.

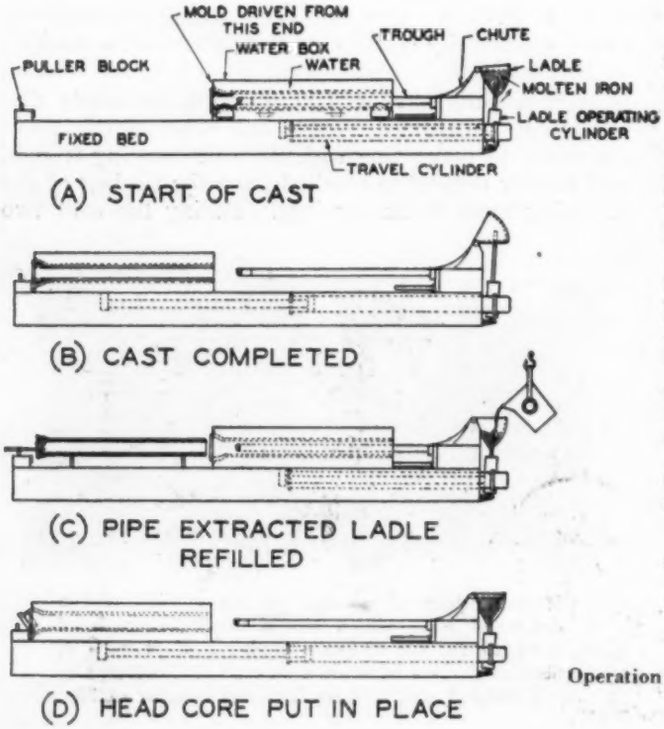
An interesting method of reclaiming these molds has been developed by Dr. F. C. Langenberg, director of research of the U. S. Pipe & Foundry Company. The process is basically a cold-working operation and has been applied to the cold working of centrifugally cast steel guns at the Watertown Arsenal. The mold, if necessary, is drawn to an even hardness and is assembled on a mandrel, the diameter of which is carefully computed so that subsequent reduction of mold diameter is sufficient to eliminate internal scores and checks. The mold and mandrel are inserted in a steel container and the ends packed. Water is then admitted to the space between mold and container at sufficient pressure to squeeze the mold down on the mandrel. Pressures as high as 50,000 lb. per sq.in. are employed. When the mold is down on the mandrel, pressure is released and the mold and mandred removed from the container. The elastic recovery of the mold is sufficient to permit the mandrel to be withdrawn, and the mold is then rebored to standard inside diameter, trued up outside if necessary, and returned to service. This operation can be repeated until the walls of the mold become too thin.

The first commercial type of furnace was the batch type, with a combustion chamber 5 ft. wide by 15 ft. long, fired by oil burners on each side, and with a capacity of five 6-in. pipe or three 12-in. pipe 12 ft. long. The pipe rested on two sets of heat-resistant alloy wheels, the center shafts of which extended to the outside of the furnace where they were driven by worm and gear. This furnace had limited capacity, was difficult to charge and discharge, had low efficiency, poor heat control and excessive annealing costs.

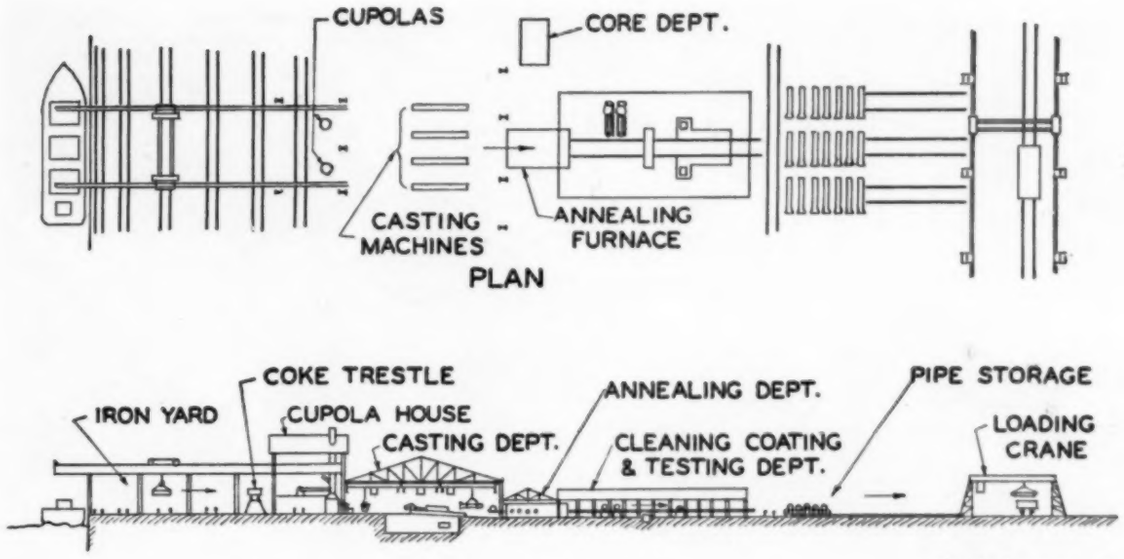
The next major improvement in furnace design was a continuous-wheel conveyor type, from 30 to 35 ft. long



deLavaud machine electrically driven by a planer-type variable-speed motor with a special ball bearing mounting



Operation of the machine

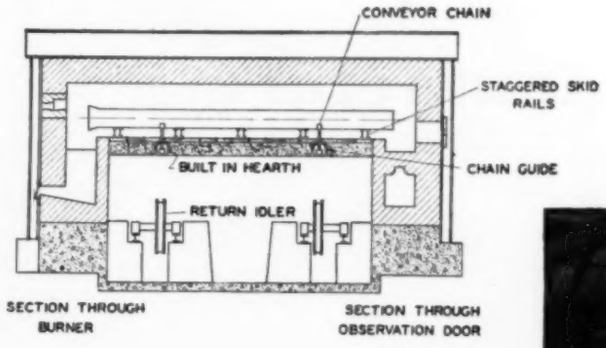


Typical layout of a four-machine deLavaud unit

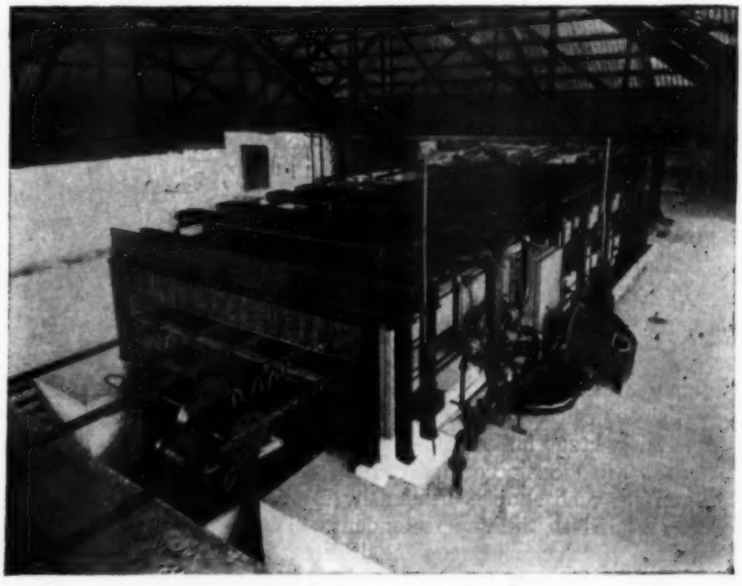
and with a removable car hearth on which is mounted an ingenious wheel-type conveyor. The wheels or cams are of heat-resisting alloy and are driven through a worm shaft running down the centerline of the furnace under the hearth insulation. As these cams rotate, the pipes are advanced from one set of rollers to another and also rotate continuously about their own axes.

This type of furnace though vastly improved, still has certain disadvantages. Since the pipe is resting on two lines of rollers only, there is some tendency for the 3- and 4-in. sizes to bow slightly due to their overhanging ends. Furthermore, the furnace, when operating at maximum rated capacity, discharges the pipe at temperatures above those desired. These furnaces are therefore being superseded by longer continuous furnaces of the chain conveyor type. Pipes are rolled through the furnace on a slight upward incline by means of two parallel chains equipped with heat-resisting alloy pushing fingers of special design. Pipes roll on six parallel lines of staggered alloy skid rails, thus providing a practically continuous bearing surface and minimizing the danger of bowing or distortion.

Since both skid rails and pushing fingers reach the same temperature as the pipe, there is no danger of cold spots on the pipe at points of contact, permitting the furnace to be operated at lower temperatures than were previously considered practical. Two furnaces now being built are 75 ft. over-all and will handle 24-in. pipe 18-ft. long.



Construction of a modern annealing furnace for 18-ft. pipe



Exterior of the annealing furnace. It is of the chain conveyor type, is 54 ft. long, and has a maximum rated heating capacity of 25 tons of pipe per hour in diameters of 4-12 in.

Management for made-to-order manufacture

W. A. COULTER
Sikorsky Aviation Corporation, Division, United Aircraft & Transport Corporation

IN aircraft manufacturing as it is today, engineering is continued on into the shops. At the Sikorsky plant, the heads of the three divisions of the Manufacturing Department—Planning, Operating and Supply—are all engineers of experience, aeronautical and mechanical. It is the function of the Planning Division, headed by the Planning Engineer, to prepare the new designs for production. The Supply Manager is responsible for all material control, including purchasing, storing and issuing to the shops. The Operating Division is headed by the Superintendent, who controls the personnel engaged in actual building of airplanes. The factory is divided into shops according to the character of the work done, and each shop is headed by a supervisor directly subordinated to the superintendent. This arrangement is very effective when several different projects are in process. The supervisors take the greater part of the burden of supervision from the superintendent and leave him free to engage in the many engineering problems that are constantly arising and that must be solved as they come up.

There are five main shops besides the Tool Shop, including:

Wing Shop—all wings and tail surfaces are made here.

Sheet Metal Shop—all sheet metal parts including hulls, tanks, pontoons, cowlings, etc.

General Metal Shop—This shop includes the machine shop, and all wing and strut fittings, control parts and miscellaneous metal parts are produced here.

Assembly—General assembly of the airplanes.

Finishing—All painting, plating, anodic treatment, woodwork and upholstery.

The Manufacturing Department is headed by the Factory Manager. To assist him there is a Planning

Board and Planning Engineer. The Planning Board is an advisory board made up of members of all departments, and convened by the Factory Manager. To this Board the Factory Manager presents preliminary plans and schedules for discussion and consideration. At these meetings, schedules are worked out with the co-ordination of all departments, and when they have been approved, definite orders are issued. These manufacturing orders originate in the Factory Manager's office and go to the Planning Division. There drawings are prepared and bills of material drawn up and the materials requested from the Supply Division. The Planning Division also issues the work orders to the shop, together with material requisitions. The work order is in the form of a tag with blueprint attached. The tags are made up in several perforated sections with a section for each process involved in the manufacture of the part. For example, in addition to making a part there may be heat-treating, cadmium plating, painting, etc.

The Planning Division is organized on the same basis as the regular Engineering Department, but distinct from it in that it is made up of practical men, in the main mechanical engineers, with knowledge of materials and markets and a background of general mechanical experience. Having received the outline of a new design from the Engineering Department, it is the task of this department to work out the details. In order to accomplish it in the most efficient manner the division is divided into groups, each group with its leader specializing on a certain part or section of the airplane. These groups are:

1. Hull, cabin and pontoons.
2. Wings and tail surfaces.
3. Power Plant.
4. Flying and Motor Controls.
5. Landing gear, brakes, etc.
6. Fuel and oil system, instruments, and electric equipment.
7. Cabin and cockpit equipment.

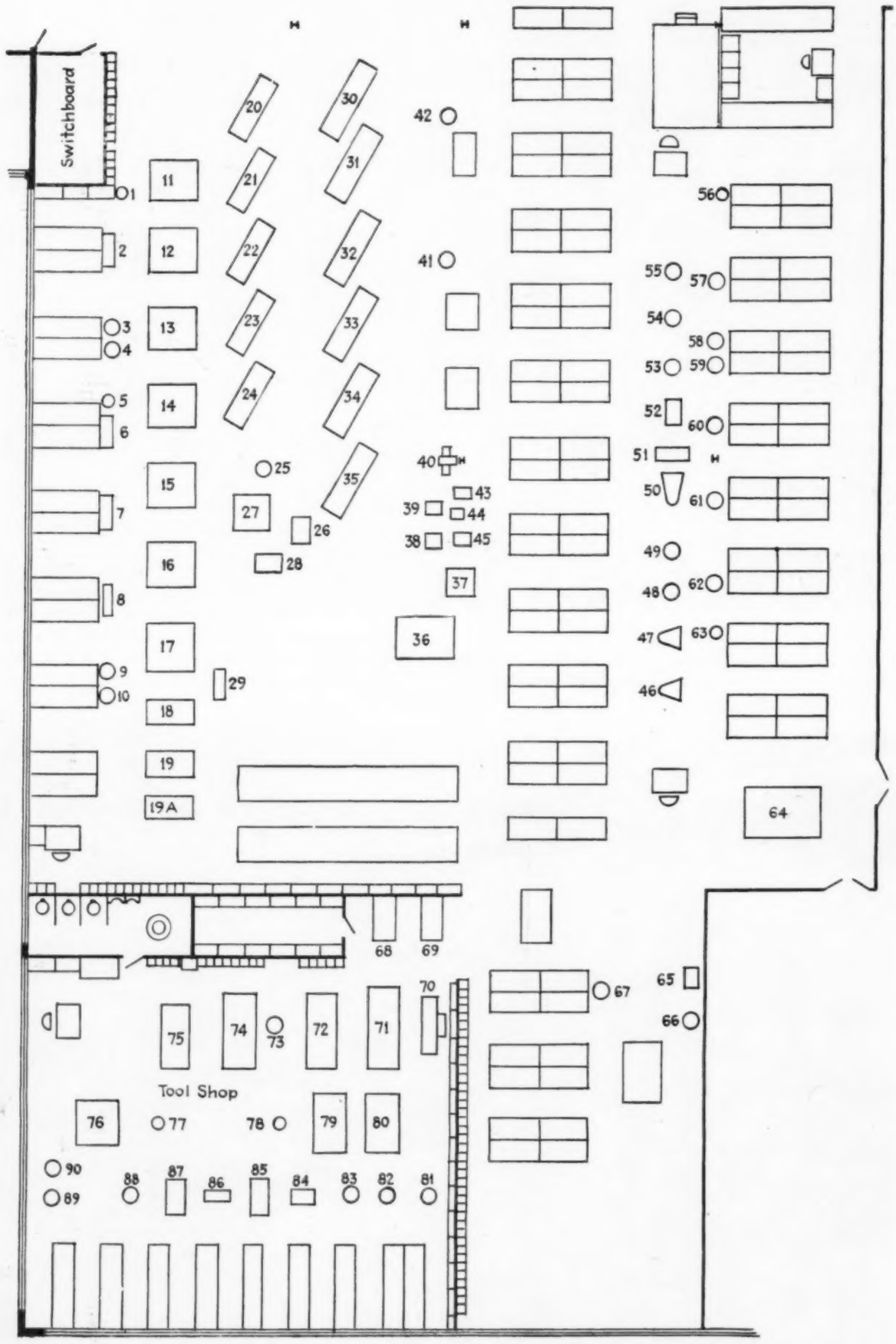
The manner in which the general Engineering Department and the Planning Division are organized brings out the two phases of aviation engineering that are fundamental. The field of the general Engineering Department is mainly aeronautical, making use of the science of aerodynamics backed by experiments conducted in the wind tunnel. When a new airplane is conceived it is the function of this Engineering Department to work up the data on performance, loading, stress analysis, balance diagrams, weights loaded and empty and similar data. If the design is accepted and a manufacturing program is approved, the above data is presented, together with the general specifications, to the Planning Division, which, as previously outlined, prepares drawings and details necessary for production.

The dividing line between the Engineering Department and the Planning Division is distinct, and it is interesting and logical that the latter is part of the Manufacturing Department. Its problems are practically all mechanical, but with the benefit of data resulting from the experience and knowledge gained in a hundred years of manufacturing and engineering. The field of aeronautical engineering, however, has hardly been scratched, and the men in this line are getting their data mainly through experiments and are arriving at the final

Getting engines ready for assembly on planes. The raised platform adds to ease in assembling, since engines are on the same level as their mounts

A general view of the machine shop looking toward the tool and die shop

AUTOMOTIVE · PRODUCTION



1	U.S. El. Co. - Grinder 7"
2	Seneca Falls - Star Lathe 10"
3	Canedy-Otto Co. - Drill Press
4	" " " "
5	U.S. El. Co. - Grinder 6"
6	S.A. Potter, N.Y. - Bench Lathe 6"
7	Starr Tool Co. - Bench Lathe 8"
8	Canedy-Otto Co. - Drill Press - Three Spindle
9	" " " Drill Pres."
10	" " " " "
11	Brown & Sharpe - Milling Mach. #2B
12	" " " " #2B
13	" " " " #3A
14	" " " " #3B Heavy
15	Milwaukee - " " #3 Heavy
16	Brown & Sharpe - " " #2B
17	" " " " #2B
18	Van Norman - " " #20
19	Cincinnati - Shaper 20"
20	Lodge & Shipley - Lathe 14" - Engine.
21	" " - " " "
22	Reed-Prentice Corp. - Lathe 16" Engine
23	" " " - " " "
24	" " " - " " "
25	Canedy-Otto Co. - Drill Press
26	Kent Owens - Hand Milling Mach. #1.
27	Cincinnati - Automatic 24" Milling.
28	Racine Tool Mach. Co. - Racine - Shear Cut.
29	Canedy-Otto Co. - Drill Press - Three Spindle
30	Reed-Prentice Corp. - Lathe 16" Engine
31	Warner & Swasey Co. - Screw Mach. #2.
32	" " " - Turret Lathe #4.
33	" " " - " " #6.
34	" " " - " " #6.
35	Le Blond 19" Heavy Lathe
36	E.W. Bliss Co. - Power Press #6.
37	" " " - " " #3.
38	Zen-Hannemann Co. - " " #5.
39	V. & O. Press Co. - " " #1.
40	Brown & Sharpe - Screw Mach. #2.
41	Canedy-Otto Co. - Drill Press
42	" " " - " "
43	V. & O. Press Co. - Power Press #01.
44	Loshbough-Jordan - Power Press #3.
45	E.W. Bliss Co. - Power Press #21
46	A.C. Campbell Inc. - Nibbling Mach. #2.
47	" " " - " " #2.
48	Black & Decker Mfg. - Grinder Buffer
49	U.S. Elec. Co. - " "
50	Unishear Co. - Unishear #0-36
51	Buffalo Forge Co. - Buffalo #0 Iron Plate
52	Jones Superior Co. - Table Saw.
53	Syracuse - Band Saw
54	Canedy-Otto Co. - Drill Press
55	" " " - " "
56	U.S. El. Co. - Grinding 6"
57	Canedy-Otto Co. - Drill Press
58	U.S. El. Co. - Grinding 6"
59	Syracuse - Grinder
60	Canedy-Otto Co. - Drill Press
61	Syracuse - Grinder
62	Canedy-Otto Co. - Drill Press
63	" " " " "
64	"Niagara" - Shear.
65	De Walt Prod. Co. - Metal Saw
66	Canedy-Otto Co. - Drill Press
67	U.S. El. Co. - Grinding
68	Brown & Sharpe - Surface Grinder #2
69	" " - " " #2
70	" " - Universal Grinder
71	Reed-Prentice Corp. - Lathe 16" Engine
72	Hendey Mach. Co. - Lathe 14" Engine
73	Syracuse - Band Saw
74	Lodge & Shipley - Lathe 14" Engine
75	Hendey Mach. Co. - Lathe 14" Engine
76	Brown & Sharpe - Milling Mach. #2A.
77	U.S. El. Co. - Grinding 6"
78	" " " - " 6"
79	Cincinnati - Shaper 20"
80	" " 20"
81	Canedy-Otto Co. - Drill Press
82	" " " - " "
83	" " " - " "
84	Chas. G. Allen Co. - Drill Press
85	Starr Tool Co. - Bench Lathe #4
86	"Racine" Junior - Mach. Saw.
87	Starr Tool Co. - Bench Lathe #4
88	Chas. G. Allen Co. - Drill Press
89	"Thiel" - Filing Mach. #3.
90	Cochrane-Bly Co. - Filing Mach. #2
91A	G & E — Shaper 16"

Complete layout of the machine shop, listing machines and locations

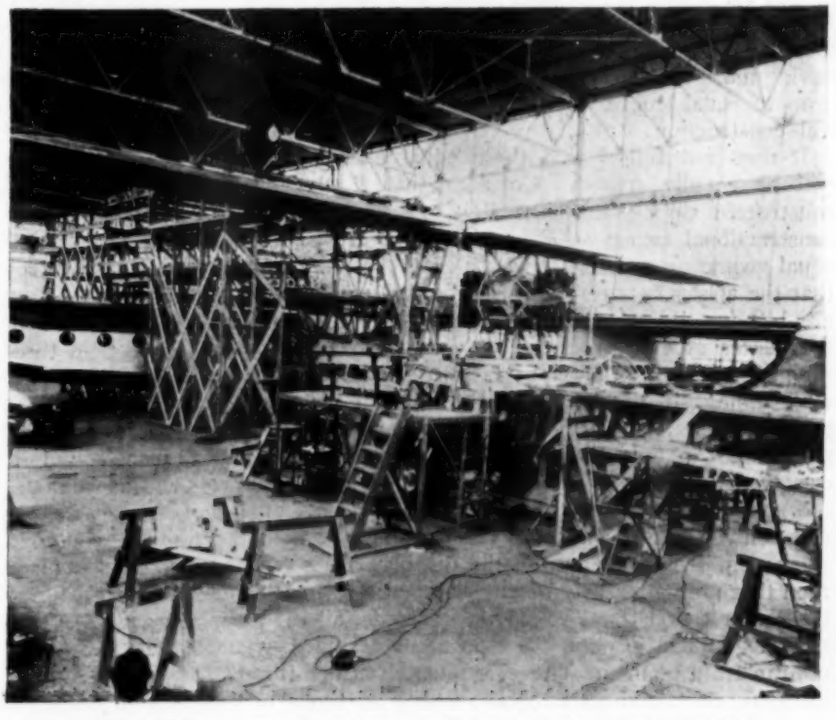
results by means of "cut and try" methods. These results in general are compromises with the ideal.

When the Planning Division has received the specifications from the Engineering Department, preliminary drawings of the principal assemblies are prepared and building of the experimental airplane is started. Detail drawings are made following the progress in the shop. When the airplane is completed, it is flight-tested thoroughly to remove all of the "bugs." The next step is to prepare the design for production. Generally, the experimental design must be modified to some extent to suit the requirements of economies in production or the tools and equipment on hand. On government contracts, the number of planes to be built is definitely known and specifications are uniform for the series, but on commercial planes, especially of the size being built at this plant, the quantity to be built eventually is not known at the outset, and the initial production quantity must be determined.

The extent of tooling-up is a constant problem. Engineering changes are inevitable due to improvements which are continuously developing and the variations in the requirements of the customer. One customer may be a private owner who intends to use his plane for both pleasure and business, but who will require a specially fitted cabin. Another customer may be an air line that intends to fly the planes over long distances and therefore requires a greater amount of fuel, which means providing extra fuel tanks but reducing passenger capacity. Still another customer may demand a greater useful load, necessitating probably a stronger wing and stronger landing gear and sacrificing some performance.

The planes, therefore, are not "production" built, but "custom" built, and each departure from the standard design breaks up the smoothness of production and makes ideal planning impossible. The manufacturing of airplanes could be compared somewhat with that of boats and yachts, where the problems of market and production are somewhat the same, but where the engineering problems are small in comparison with those of the airplane industry. The accompanying view in the assembly bay gives some idea of the problems encountered in assembling two different types of airplanes simultaneously. While it is strangely reminiscent of custom-built automobile or boat manufacture, the much greater difficulties are strikingly evident.

Second and last installment. The first appeared last week.



Two different types of airplanes under construction simultaneously

The first two articles of this series analyzed three-point gages with equal arms equally spaced. It was shown that an infinite number of non-circular shapes would fit any position of these gages. The form of the shape generated varied with the path of the moving center of the gage, the length of the arm, and the direction of rotation

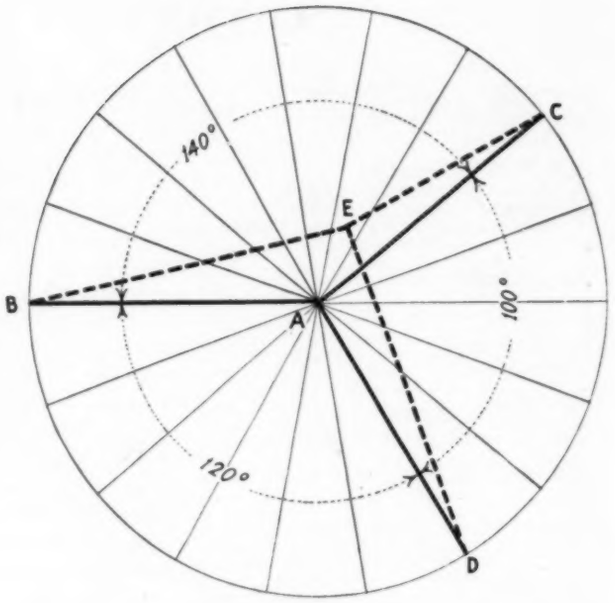


Fig. 23—A three-point gage having unequal arms may be considered geometrically as having equal arms. This does not mean that the arms will be spaced symmetrically

Multipoint Gages

HARRY SHAW
Tool and Gear Consultant,
Heywood, England

THREE-POINT gages are not always made with equal arms. But since we are dealing with the gage from a geometric viewpoint, all three-point gages intended for measuring circular work may be regarded as having equal arms, for a circle can always be drawn to pass through the end points. For that matter, gages having more than three arms may be regarded as having arms of equal length whether or not this is the mechanical construction.

It does not follow that these equal geometric arms will be equally spaced. Consider that the unequally constructed three-point gage *BDC* (Fig. 23) with its constructional center at *E* has been converted into the equal geometric gage *BCD* whose center is *A*. Suppose that the angles between the arms of the geometric gage are 140 deg., 120 deg., and 100 deg. Now, if we move the center *A* right round a closed centrode and turn the gage through an angle of 140 deg. on its own center while doing so, the arm *AC* will take up the position that the arm *AB* occupied before the turning (if the motion is counterclockwise), but the arm *AB* will not occupy the position *AD* and the arm *AD* will not occupy the position *AC*. If we turn through 100 deg. or 120 deg., only one arm will occupy the position occupied by the one in front of it before the turning. It is obvious then that no matter how much the gage is turned, while the center travels once round the centrode, all the arms cannot be made to occupy the positions occupied by the ones in front of them. The gage must be turned through an angle contained an integral number of times in the angles between the gage arms, while traversing the center once round the centrode, and to trace a complete closed shape the center will have to be traversed round the centrode several times.

The largest angle that is contained in any number of angles, is the greatest common factor of those angles. The greatest common factor of 140, 120, and 100 is 20 being contained in those angles 7, 6, and 5 times. If we turn the gage through 20 deg. while traveling the center round the centrode once, we must travel the center round the centrode 7 times before a closed figure is formed.

Fig. 24 has been drawn by rotating the line *PA* through 20 deg. while turning the center *P* once round the circular centrode, and this process has been continued for seven turns of the center round the centrode, when the line *PA* will occupy the position *B*, or *A* 7, the line *PB* the position *C* 1 or *B* 7 and the line *PC* the position *A* 2 or *C* 7. It will be seen that the points *B* and *C* have traveled over part of the path that the points *C* and *A* in front of them traced, so that if we continue turning the gage, the points will still keep to the same contour.

It is clear that a gage with any number of points more than three and up to eighteen, spaced 20 deg. or integral multiples of 20 deg. apart, will fit in the figure quite as easily as if it were a circle, so that a gage with that number of arms so spaced would not detect the out-of-roundness of the figure. If we selected a gage with certain of the points numbered and lettered in Fig. 24, we would find that while the gage would, if pressed to the contour, touch it in all the positions in which it could be placed, it could be moved laterally. For instance, if we took the gage having points *A*, B 1 and *C* we could move the gage in the direction shown by the arrows.

If a gage has *N* unequally spaced arms and the angles whose arms make with one another are *A*, *B*, *C*, *D*, *E* and so on, then if *G* be the greatest common factor of

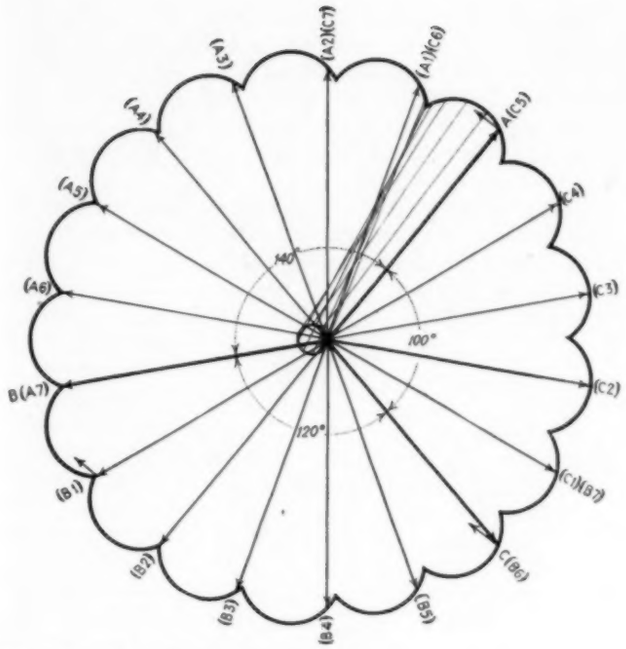


Fig. 24—A three-point gage with arms spaced at 140, 120, and 100 deg. will fit this shape when its center is moved around a circular centrode. The gage must be rotated through only 20 deg. for each complete circuit of its center

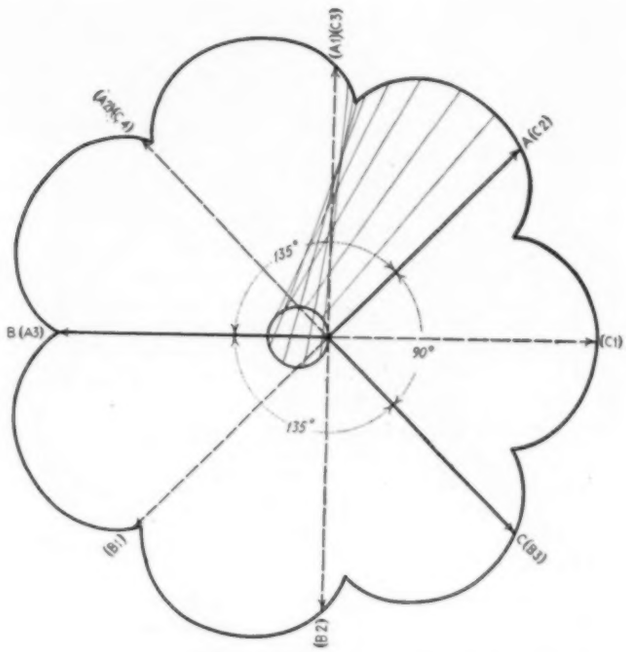


Fig. 25—When the angles of the gage arms are 135, 135 and 90 deg. the above shape is generated. An equal armed eight-point gage will fit this figure

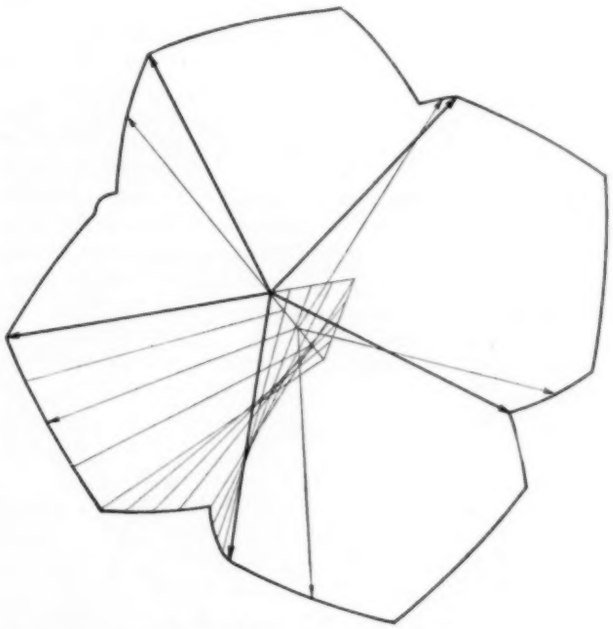


Fig. 26—An equal five-point gage whose center moves around a triangle generates this shape. The gage must turn 72 deg. while its center moves around the centrode once

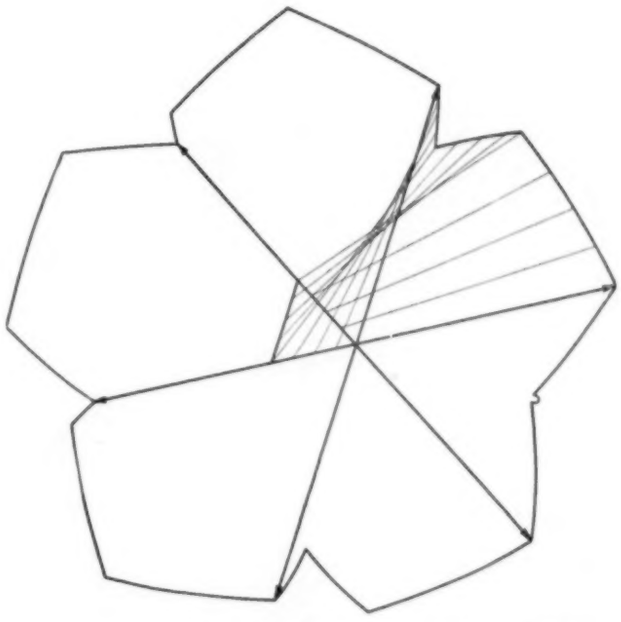


Fig. 27—This shows a shape in which an equally spaced six-point gage will fit when its center moves around a triangle

these angles, we must, to construct a figure that the gage will not detect from a circle, trace it out by the end of an arm that turns through G deg. for each movement of the center round the centrode. The figure produced will not be detectable from a circle by multipoint gages that have their arms equally spaced G deg. or any integral multiples of G deg. apart. The maximum number of points that the gage can have will be $360/G$.

An analysis of the shapes produced will reveal that the figure with a circular centrode and retrograde motion has a number of sides, equal to the number of points in the gage, plus one, and that produced with the motion of the gage arms and center in the same direction has as many sides as the gage has points, less one.

Figs. 25, 26, and 27 are drawn to show how greatly a figure can vary from roundness and yet not be detectable as doing so by multi-point gages. Indeed when we look at these figures and then think for how long the

three-point gage test was considered to be an infallible detector of out-of-roundness, it can hardly be believed.

Fig. 28 shows a commercial type of three-point gage using spherical diamond points. The radii of the spherical points are so small that they may be considered to make point contact with the work and will not therefore detect out-of-roundness as has been shown. It is claimed for certain four-point gages that neither irregularity or elliptical formation of the bore can escape detection. But from the data presented it may be seen that no matter what number of points the gage may have, certain shapes may be produced that the gage will not detect as being out of round. Fig. 29 shows a shape that is obviously not round, and yet this would when tested with an equal armed four-point gage, be passed as round.

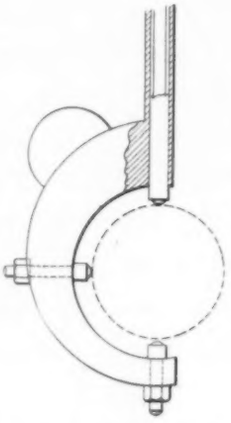


Fig. 28—One type of three-point gage employs small spherical diamond contact points

While some gages are made with sharp points, the majority are made with flat or spherical ends. If the spherical ends are of small radius they may be regarded as points; if not, they may be regarded as flats, for a small part of a sphere is practically a flat.

The shapes that we have discussed have been shown drastically out of round for emphasis, but these drastic shapes are not the ones that are encountered in practice. Shapes based on the same geometrical construction but deviating from a circle by a few thousandths are encountered, the centrodes in practice being much smaller in relation to the size of the work that has been shown. This being so, the point that makes contact with the work will not alter its position on the flat many thousandths, so the only effect of the flat will be slightly to flatten all the curves that make up the contour of the piece and the actual principles remain unaltered.

Ring and plug gages are sometimes lightened by cutting away part of the contour, in effect making a gage that has several small contact surfaces. If these contact surfaces are small enough in comparison with the size of the gage, then the gage becomes, in effect, a multipoint gage, and will not in all cases detect the divergence of work from roundness.

Rough machine reamers sometimes leave a rough or wavy surface. If a hand reamer with the same number of flutes is used for finish reaming the hole, this wavy effect will still be retained. So it has been suggested many times that the hand or finishing reamer should have a number of flutes that is prime to the number of flutes in the machine reamer, when it is claimed that the hand reamer will not follow the waves produced by the machine reamer. Suppose the machine reamer is caused to produce the wavy contour because of unevenness or lack of homogeneity in the material. The wavy effect is produced because the center of the reamer is moved round a closed centrode while it turns on its own center, the cutting edges of the reamer all remaining in contact with the

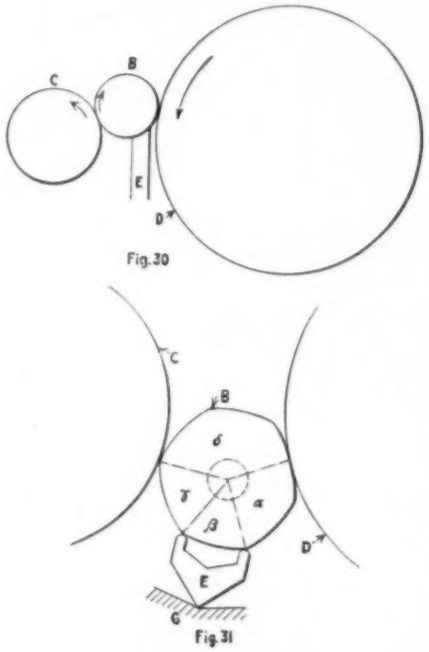


Fig. 30—Work supported as shown in a centerless grinding machine may be ground as a polygon with curved sides. Fig. 31—Even the improved support covered by a Swedish patent will not entirely eliminate the possibility of noncircular work in centerless grinding

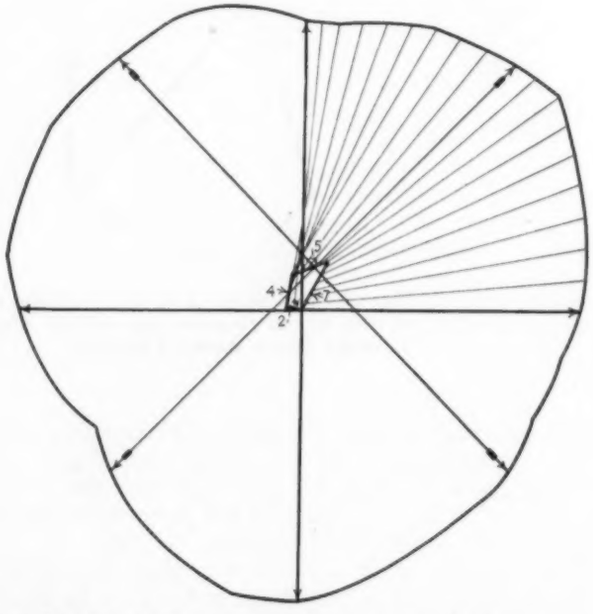


Fig. 29—A shape such as this may pass the inspection of an equal four-point gage

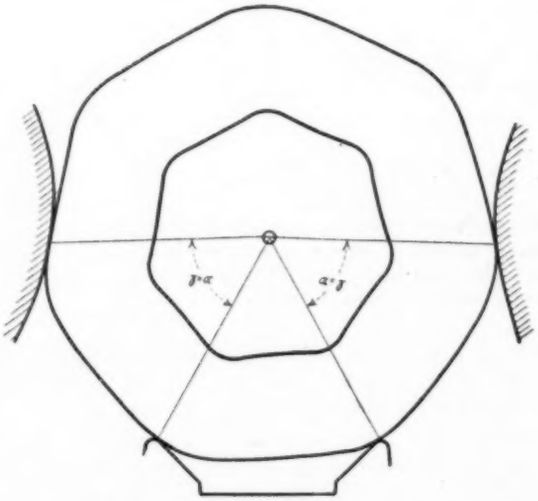


Fig. 32—The patented four-point support for centerless grinding may produce work such as that illustrated

sides of the bore. Now suppose the reamer has 6 flutes and that the center of the reamer, owing to lack of homogeneity in the material, is caused to move round the centrode 42 times while the reamer turns round its axis once. A little thought will reveal that a hole would be produced which neither a 3-, 6-, 7-, 14-, 21-, or 42-point gage would detect as not being round, so that it is obvious that it would be useless trying to remove the wavy effect with either a 7-, 14- or 21-fluted finishing reamer. But the number of flutes in the machine reamer is prime to the numbers 7, 14, and 21. Therefore, the statement about using a reamer with a number of flutes prime to the number of flutes in the preceding one to eliminate waves is not accurate.

Of course, in many cases and probably the majority, the waves would be removed, because the number of times that the center of the reamer moves round the centrode, varies with the conditions. If the machine reamer had 6 flutes and the number of turns made by the center round the centrode was 66, then either a 5- or 7-flute reamer would probably remove the waves. The statement was challenged because it is not universally correct and not because it is not useful in practice, though in some instances it has failed.

It has been mentioned that certain non-circular shapes are produced on centerless grinding machines, the shapes taking the form of polygons with curved sides. While the polygons are usually of regular form, they are not always so. Centerless grinding is usually done as shown in Fig. 30, where B is the work, C is the regulating wheel, D the grinding wheel and E a stationary guide or support. The lobed or polygonal effect is produced by the center of the work being able to move while the surface of the work still makes contact with the regulating wheel, the grinding wheel and the stationary guide. The greater the number of points in contact with the work the smaller will the shape of the centrode become from the same error in the work, or the smaller the error in work for the same size of centrode. If an infinite number of points were in contact with the work, the work would be purely circular.

As only one circle can pass through the three points of contact in Fig. 30, if we want to add another point of support, that support must be self adjustable so as to keep in contact as the size of work alters, as grinding proceeds. A method of doing this, forms the basis of a patent by Axel Gusta Emanuel Hultgren of Soderfors, Sweden.

Fig. 31 shows this method. The guide E has two points of contact with the work, being enabled to keep these two points of contact and is able to rock round a center at G. After stating the results of certain experiments, Hultgren proceeds by various calculations to attempt to prove that if the rocking support is placed so that the angle α equals γ, it is impossible for a polygonal shape to be ground.

It is possible to produce shapes of which the center can be moved and yet the contour remain in contact with four points no matter how they are spaced. Fig. 32 shows a shape in contact with a grinding wheel and a rocking support arranged so that α equals γ and which will remain in contact with all objects in every position in which it can be arranged. There is no fault to find with Hultgren's mathematical proof, but there is with his initial reasoning. He made the mistake of assuming that the types of shapes he obtained by experiment are the only ones obtainable. But the shapes depend upon various variable conditions, such as the make of machine, the grinding wheel, the homogeneity of material ground. The mathematical laws, while correct in themselves, are built on the assumption that the results obtained by experiment were the only ones obtainable. The chief mistake is in assuming that the polygons must be regular. We know that they can be irregular.

The divergence of shapes from roundness increases as the size of the centrode increases in relation to the size of the figure, and decreases as the number of times the center of the work travels round the centrode increases. As the size of the centrode cannot, in practice, be more than a few thousandths in size, if we can increase the number of times that the center of the work travels round the centrode, we will reduce the divergence of the work from roundness. The number of times the center of the work travels round the centrode increases as the greatest common factor of the angles between equal lines drawn from one point to the points of contact on the work decreases. So we must arrange the points of contact so that this greatest common factor is as small as possible.

If we have four points of contact, and the lines drawn from them to the center are 90, 90, 90.009 and 89.991 deg. apart, the number of times that the work must turn round the centrode while it turns once on its own center is $360/0.001 = 360{,}000$. This means that the work will have 360,001 equal lobes, if the motion is retrograde and the centrode circular, and 359,999 if the motion is alike and the centrode circular, so that the divergence from a circle of moderately large work is very little.

The angles between the points of contact could be made 90, 90, 90.000...1 and 89.999...9 deg. Then the number of lobes for retrograde motion round a circle will be $(360/0.000...1) - 1$, and for the gage and center with the same motion round a circular centrode, $(360/0.000...1) - 1$. It is evident that the amount of divergence from a circle can be reduced as much as desired, provided that we can adjust our grinding support as accurately as we want. Therefore the accuracy obtainable depends upon the accuracy of the machine.

The third and concluding article under this title. The first two appeared on pages 43 and 173, Vol. 75.

Wasting Time With Thread Fits

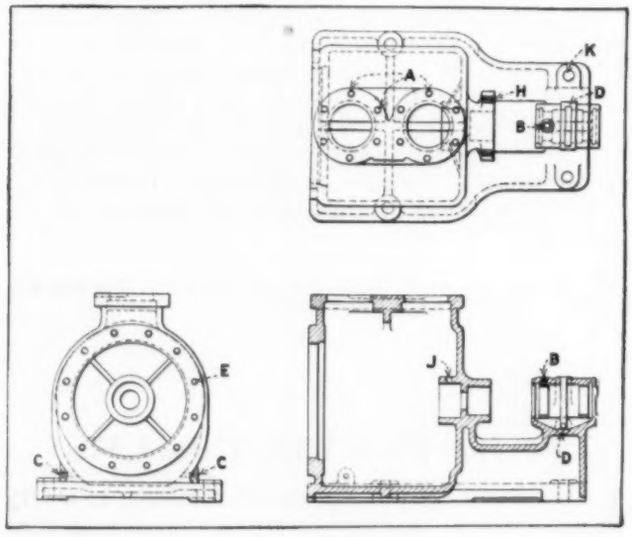
THERE is a lot of time wasted, according to a very practical man we know, in trying to secure accurate leads on threads for bolts, screws or studs. Lead screws and screws that are used for measuring should be as accurate as possible, but even a well known jig borer uses a correction cam to advance or retard the nut on the screw. When it comes to bolts, screws or studs, the length of engagement is rarely long enough to make any ordinary variation in lead of appreciable consequence. In fact it frequently helps in securing a better fit, especially in the case of studs. If anyone who is interested will spend a little time with bolts and nuts having different shaped threads they may learn a lot. Mixing up bolts and nuts with V, U.S.S. or American, and Whitworth threads is an interesting experiment, a very instructive one also.

Ideas from PRACTICAL MEN

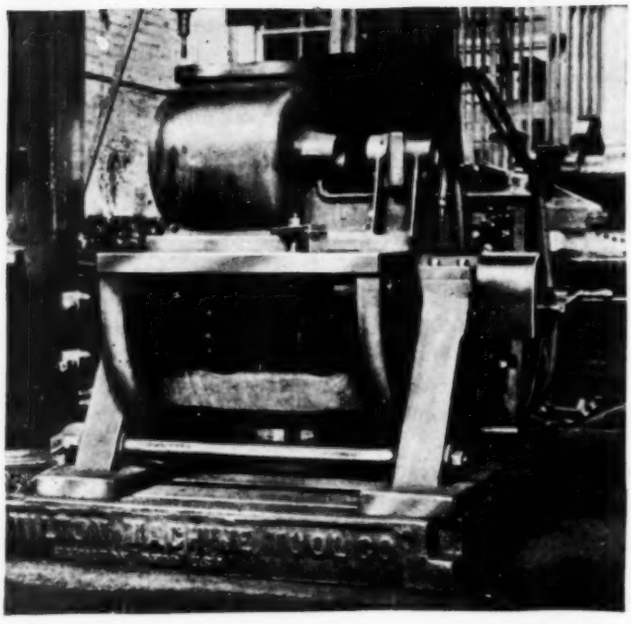
An Indexing Table for the Radial Drill

CHARLES C. TOMNEY
Chief Tool Designer,
Brunswick-Kroeschell Company

For drilling and tapping some of the holes in our medium-size crankcases, we made the indexing table shown in Fig. 1 for our radial drill. The table is arranged to rotate about a horizontal axis, being operated by the crank at the right through miter and worm gearing. An index pin is used for locking the table at the position required by the work. A series of holes in the top of the table makes provision for the use of the necessary stops and clamps.



One of the crankcases is shown in Fig. 2. In the set-up in Fig. 1, the crankcase is in position for tapping the holes *A*, and drilling and tapping the hole *B*. For drilling and tapping the holes *C*, on each side and the hole *D*, the table is indexed 90 deg. past the center, first in one direction and then in the other. For tapping the holes *E* and drilling and tapping the holes *H*, the crankcase is rotated 90 deg. on the table in a horizontal plane and the table is indexed 90 deg. on each side of the center.



For drilling the oil hole *J*, the table is indexed to the proper angle. Holes *A* and *E* are drilled in a multi-spindle drill, while the holes *K* are cored. It will thus be seen that it is necessary to disturb the original setting of the work on the table but once, all other settings being cared for by indexing the table.

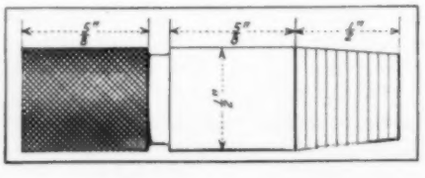
Before making the indexing table, each operation on the crankcases was performed separately. Since the operations were short, it was necessary for the machinist to have a helper until the work on a batch of crankcases was completed.

An Economical and Efficient Gage

CHARLES J. HEYELMAN

The sketch shows a plug gage having a tapered and graduated end. It is used in boring holes to tell how much metal is to be removed to bring them to size after they have been roughed out, thereby saving a lot of fussing with inside calipers.

I make such gages in sizes from 1 in. down out of drill rod, holding the rod in a draw-in collet while doing the turning. The end has a taper of 0.016 in. per in., axially. Since the graduations are $\frac{1}{16}$ in. apart, the diameter varies 0.001 in. for each graduation. The graduations are cut in rings from 0.003 to 0.005 in. deep.

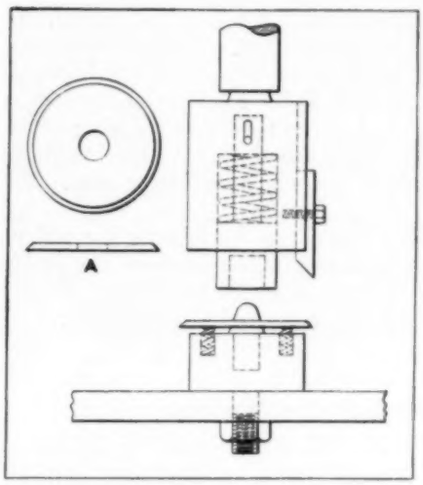


A peculiar thing about the drill rod is that when quenched for hardening it expands about 0.001 in., but when drawn to a light straw color it comes back to almost the original diameter, leaving just enough metal for lapping to a fine finish. If drawn to a medium straw color, it will require no lapping.

Tools for Chamfering Washers

CHARLES KUGLER

We had to chamfer a large quantity of brass washers like the one shown at *A*. It was thought that the job would be an easy one, in fact, one foreman said there would be no trouble. However, we soon found that to do the job on a production basis, there must be some simple means for placing and removing the washers, and for preventing them from slipping under pressure of the cut. While the work could have been done in the lathe, we chose to do it in the drill press, believing it to be the better machine for the purpose. Accordingly, we made the simple tools illustrated. A shouldered stud having springs placed in drilled holes, and equipped with a square, tapered pilot, was attached to the drill-press table, as shown in the illustration. The chamfering tool, having a spring-actuated plug, was held in the spindle.



In operation, the washers are placed over the square pilot. When the spindle is lowered, the spring-actuated plug presses the washers down against the springs and on the shoulder of the stud, the sharp corners of the pilot biting into the holes. Since the spindle is brought down against a positive stop, the washers are all chamfered to the same diameter. When the spindle is raised, the springs in the stud force the washers upward and out of contact with the sharp corners of the pilot, permitting them to be easily removed.

An Expansion Boring Head—*Discussion*

J. T. TOWLSON
London, England

The expansion boring head described by Ralph E. Hendrickson in an article under the title given above (*AM*—Vol. 74, page 589) is, to say the least, a neat little contrivance. But why did he make such a patchwork job of the construction? The segment *A* is fastened by pins, and small pins at that. It would have been an easy job to have milled the slot in the solid bar. I would suggest, too, that instead of the pivot on which the toolholder swings being just an ordinary fitting pin, it should be a bolt or a stud, so that the rectangular toolholder could be firmly gripped after it was set for a particular sweep of cut.

But, honestly, I must confess that such pivoted devices do not appeal to me. With such a means of tool adjustment, and with varying distance of projection of a particular tool (or various tools) beyond the holder, one never knows how much the tool has been moved. Of course, the user knows that the tool has to be adjusted to bore a larger or a smaller diameter; but how much?

I prefer boring heads that have a positive sliding adjustment of the toolholder, and adjustable by a micrometer screw, so that if one needs to enlarge a hole, say, 0.004 in., the slide must be moved 0.002 in. The Casler boring head (as well known in England as in America) is a good type of the kind of head referred to.

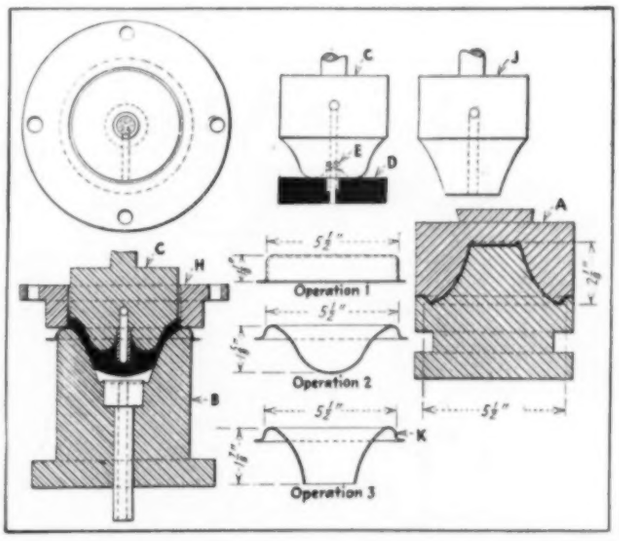
Press Tools for Forming a Bowl

C. R. ROBERTS

While a considerable amount of data are available for standardizing the operation of drawing sheet metal into tubes of different diameters and depths, when the tubes have tapered or curved sides a different problem is presented, especially on medium-sized stampings of extremely thin metal.

The tools shown in the illustration are for drawing nickel bowls from blanks $7\frac{3}{4}$ in. in diameter and 0.012 in. in thickness. The shape of the bowl is shown by the heavy solid line in the section of the tools at *A*. To produce a bowl that is free from metal strains and wrinkles by a series of redrawing operations is a task fraught with difficulty.

In the first operation, the blank was drawn to a shallow cup of the shape and dimensions shown. Then the cup was annealed and placed upside down on the die *B* for the second operation. The punch *C* had attached to it a rubber disk *D*, 1 in. thick, and of the same diameter as that of the largest part of the punch, attachment being made by forcing it over the slitted end of the short pipe *E*. Blank holder *H* was adjusted so as to have sufficient



pressure on the work to prevent wrinkles from forming during the second operation.

Making effective contact with the outer edge of the work, the rubber disk forced the metal to the shape of the die as the punch descended, and without the appearance of any wrinkles in the wall of the shell. After this operation, punch *C* was removed and punch *J* was put in its place and used to draw the shell to the full depth of the die *B*. The work has then annealed and finished, formed, and embossed in die *A*. During this operation, the curved flange *K* on the outline of the third operation was changed from a curve to an angle. By making the disk from a high grade of rubber, several thousand shells were produced without any appreciable injury to it.

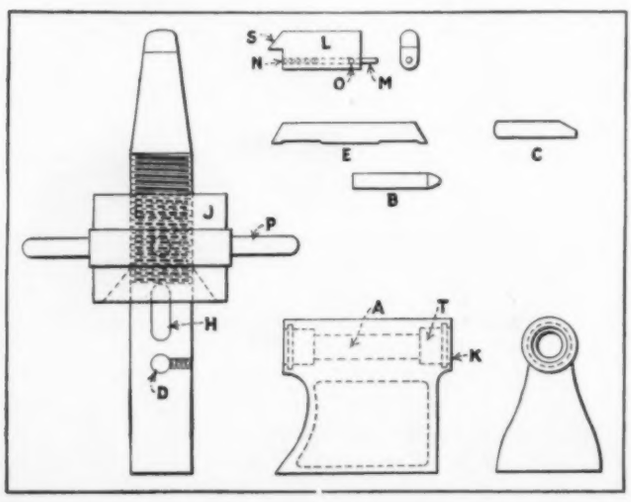
Tool for Machining Roller Bearing Seats

J. H. HARRISON
Machine Shop Instructor,
Stockton High School

Some time ago we built a small lot of wood-turning lathes, and in machining the headstocks for the roller bearings we used the tool and cutters shown in the illustration. All the work was done in a radial drill equipped with a box table.

Clamping a headstock to the side of the table, the hole *A* was bored and reamed to fit the pilot of the tool. For counterboring the bearing seats, cutters *B* and *C* were used, being successively inserted in the round hole *D* of the tool. Cutter *E* was inserted in the slot *H* and held by screwing the nut *J* against it. This cutter faced the surface *K* and rounded the edges.

Cutter holder *L* was then substituted for cutter *E*. The cutter holder carries the small cutter *M* which can be adjusted by a screw in the tapped hole *N*, and locked by the screw *O*. Grasping and holding the handle *P* while the tool is revolving, screws down the nut *J*, bringing its inner taper into contact with the angular surface *S* of the holder. Continued downward movement of the nut *J* forces the cutter holder outward, causing the cutter *M* to cut the annular groove *T* for the felt ring for excluding dust and dirt. The position of the headstock is then reversed and the opposite end is machined by repeating the process just described. We have used this tool for some time on small lots, and have found that by its use we are able to machine the bearing seats in accurate alignment.



SEEN AND HEARD

JOHN R. GODFREY

Cause and Effect

A steel company found that its large rolls were wearing rapidly. More so than seemed justifiable. Extended experiments showed that the trouble was caused by heating the rolls too rapidly when forging them. This practice caused some parts of the roll to be at or above the decalescent point while other parts were below it. This same thing also happens on different portions of the surface when the flame impinges in one spot, or when the ingot rests on the bottom of the furnace.

This difference in temperature is not compensated for by subsequent treatment. The result is a roll in which different parts of the surface are under great strains and are structurally laminated from the body of the roll. In use, small particles let go and the roll depreciates rapidly. Tool makers used to wrap a die block in waste after hardening and stow it in their bench drawer. Next morning they would find one or more corners lying where they had dropped off during the night. We used to blame the steel in those days, but we know better now. We preheat.

The steel company found that by heating the roll so slowly that the temperature gradient between the inside and outside of the roll never varied more than 15 deg. F., the life of the roll was increased 4 to 10 times.

Nameplates on Machines

Pride of recognition, both as a human being and as a skilled workman, is a greater factor than many managements seem to realize. One method of accomplishing this is in evidence in the Roanoke shops of the Norfolk & Western Railway. Every machine manned by a regular operator, and that means nearly every machine in the shop, carries a neat brass sign with the man's name on it.

The plan has several advantages. It gives the man a feeling of proprietorship in the machine and an interest in its care and performance. It makes him more than a number on the payroll, and it also enables executives who do not contact daily with the men to call them by name, which has a much better effect than calling them all Bill or George or ignoring names altogether. Pride in the job and in the machine helps both maintenance and production.

Written Orders

Napoleon had one general on his staff who was so dumb that many wondered how an individual so lacking in intelligence could hold such high rank. On one occasion when questioned, Napoleon explained: "After I have written an order for a military maneuver, I let General X read it and explain it to me. If he understands it, I know anyone will."

While it's not always expedient to keep an individual of this kind around a manufacturing organization, the same care should be taken in writing orders. It's surprising how many meanings a short paragraph may be twisted into. And the wrong interpretation is often very costly.

WALTER N. POLAKOV
Consulting Engineer

Industrial Conditions in Russia

WHEN we observe an event we observe the whole complexity of it within the space and time of our observation, with all its local color, as poets would say, and against a background of historical perspective. That is something very different from what you can describe in words in an utterly different environment. Moreover, the fundamental postulates of the social and economic structure of the U. S. S. R. are so different from those with which we are accustomed that even the most familiar words we may use would, of necessity, have different connotations if applied to a description of familiar events here or unfamiliar events over there. Finally, the Soviet Union, as you know, is a country in the process of formation. Events follow one another with great rapidity, and that very speed of change proves a great handicap for anyone who attempts to describe what he has seen and heard. For what has been observed at the time often proves to be not the case by the time it is published.

This state of formation and the speed of readjustments create at once two characteristic features of life and work in the Soviet Union. It is at once fascinating and difficult, because of the want of precedent or a total lack of established practice and standards.

Russia today is striving to change its social and economic status from that of one of the most backward countries of the world, which it was under the régime of the Czars, and win a position among the progressive industrial countries. In the opinion of Joseph Stalin, this is absolutely essential for its very existence. Hence Russia has the gigantic task of building up industries, learning how to manage the new factories and plants and creating a new form of agricultural mass production. This alone would be a gigantic undertaking for any nation. But take into consideration the fact that only a few years ago 77 per cent of Russian population was illiterate; that up to the close of the War Russian industries were insignificant, considering the size and riches of the land; that for generations the people were oppressed and kept in ignorance with almost no outlet for genius and talent except art and abstract sciences. If you visualize all that, you may get an inkling of the practical difficulties in the way of bringing order out of chaos, organizing and managing the gigantic undertaking and, at the same time, winning the approval and support of the population, or at least of its most virile and active elements.

The much-talked-about Russian 5-Year Plan is the inevitable consequence, and the indispensable means for carrying through this ambitious task. Engineers know that it is futile to attempt to build a factory or a railroad without first surveying ground, securing appropriations and preparing plans for all necessary details. It would be even more futile to attempt to build up a prosperous country, under modern conditions of interdependence between agriculture, transportation and industry, not only within a country but also between countries, without some preconceived plan.

Now when Russians speak about their plan they do not mean thereby, merely, that so many factories of such and such capacities are to be built within a specified time, or that such and such utility should be produced within a given time and so on, but they mean, as well, that such and such financial arrangements are to be made; that import and export balances should be such and such; that public education and technical training ought to be carried out according to the specified program; that living, recreational and educational facilities should be provided for the population and so on, embracing practically the entire scope of social and economic relations within and without the nation.

That 5-Year Plan

Will, or will not, the 5-Year Plan be fulfilled in U. S. S. R.? That is, of course, not only a question, but what I must term a futile question, for its value and its success do not depend, in the slightest, upon statistical figures or percentages of accomplishment. Its value and its success lie in its existence; lie in the fact that it is a task with bonus; that it protects and rewards those who learn; that it is a psychological stimulus without equal. Personally, I have no doubt that, before the expiration of the time set, we shall hear of the completion of the construction program. What I have seen in U. S. S. R. convinces me that only extraneous circumstances can check their progress. On the other hand, I am not fully convinced that the operating programs and production figures will be attained in full, for it takes time, large planning and perfect equipment to deliver the goods; it requires skill, knowledge, experience, managerial ability and, above all, the industrial leadership to get full benefit from the existing means of production, and, in this respect Russia today is handicapped.

These managerial handicaps are fully realized by Stalin and other leaders. Newspapers are nearly all devoted to the problems of industry, publishing production reports, chastizing management, organizing competitions, offering suggestions and some even maintaining a staff of industrial investigators, besides publishing regularly correspondence from the factory workers reporting failures and handicaps encountered. In all these newspapers there was for a long time a definite, systematic campaign for the amelioration of managerial practice, while the organ of the State Planning Commission, the "Economic Life," went as far as to take under its wing the

experimental introduction of factory planning and dispatching in some of the representative plants. This uneasiness about the methods of management prompted Stalin to urge the First Congress of Industrial Executives last February to study the technique of management and production methods. A great deal of emphasis was put on this heretofore neglected phase of the industrial management.

Yet, as we all know, the technique of management alone, without the proper set up, is of little avail. When I completed my consultations and reorganizations, despite the increase of production of over 400 per cent, it became to me increasingly clear that, while good management is more important than perfect equipment, for the success of management, some other elements are essential.

The element of cardinal importance is initiative properly exercised through some functional division of responsibilities. In this respect industries of the Soviet were handicapped most seriously thanks to the habit of irresponsible committee work, fear of ignorant criticism and utter vagueness of the plant organization schemes.

Constant Criticism

Another serious handicap for delivering the best there is in man was the strange attitude of constant criticisms, reprimands, strict orders, grumbling, frowning, etc., instead of suggestions, friendly encouragements, joyful stimulation and prompt and due recognition of merits. This gloomy grouchy atmosphere acts as a wet blanket on one's enthusiasm, discourages efforts and breeds that formal, official attitude which was so characteristic of old Russia and is so utterly foreign to us.

Next comes the necessity of immediate and adequate reward. To some extent this principle was recognized. All, or nearly all, work is done on piece-rate basis, but this alone is insufficient, especially since most of the rates are set incompetently and no pieces rates at all for the clerical, engineering and executive staffs, were even attempted. There was also some reward to be had in promotions, in increased food rations, better living accommodations, but these were mostly dealt in accordance with the grade of work and not so much in relation to the personal accomplishments.

How American management methods were applied to bring order out of Russian industrial chaos will be described in an early issue by Mr. Polakov, recently consulting engineer to the Supreme Economic Council

Last but not least, from an American point of view, the shortage of engineers and executives in U. S. S. R. coupled with the eagerness to accomplish most in the least time, had undoubtedly the effect of the well known saying: "all work and no play makes Jack a dull boy." To say nothing of actually breaking down the most gifted and conscientious executives under the inhuman load, all the way down the line this ruthless sticking to the job and shying from any fun and diversion tells on the quality and quantity of the managerial direction.

It was but yesterday that I, reading the papers, noticed that these criticisms of mine are receiving the official attention in U. S. S. R. from no less a person than Joseph Stalin, in announcing his "New Economic Policy." The measures, according to "New York Times," emphasized as necessary to "throw industry into high gear," are graduated wage scale, removal of restriction from the mental workers, and particularly the reorganization of factory management on the principle of individual leadership and ultimate responsibility vested in the head director. The future alone will show how well these measures will be carried out and what results will be gotten. But even today the backward factories in U. S. S. R. realize that their shortcomings are due to lack of efficient technical management.

Don't Be Stampeded—*Discussion*

C. G. WILLIAMS

Chief Engineer, Green Bay Barker Machine & Tool Works

THERE is much of fallacy in this editorial (*AM*—Vol. 74, page 890) as indicated by a recent event. Two firms of equal experience bid on a machine to do a certain piece of work. One gave a bid of $10,000, the other of $8,500. Other bids were thrown out, and these two firms were asked to send assembly drawings. The drawings were so nearly alike as to suggest that they were copies of some other design, but no one could get a line on a similar design having been put on the market. At last both firms were asked to send their sales representatives with engineers to confer with the buyers, and if possible, to bring detail drawings.

Both groups were called in at the same time, told of conditions and asked to confer with the engineers of the purchasers to determine if there could be so much difference in the actual prices of the machines. The buyer found that the low bidder had in many cases chosen materials quite contrary to general practice effecting a considerable savings in complete cost of the machine over that of the competing firm.

In many cases a firm will have designed a product which gives such good service that the firm will apparently become the leader in its field. But because redesign costs money and no real competition has come forward, no advance in the design is made. A new, struggling firm decides to begin the manufacture of a similar tool, and looking at the project from a slightly different angle produces a better tool that can be sold at a very much lower price. Are we to accept the reasoning of the editorial or to take things at their face value? It is frequently the little-known firm that brings out a new machine, for it knows that its product must be better or cheaper to compete with the older company.

[EDITOR'S NOTE: Mr. Williams misinterprets the point of the editorial in question. This was not a case of better designing but an attempted copy at a price below cost. The buyer wanted the first machine but could not convince his directors of its value. Improved designs frequently come from new concerns, but Mr. Williams is wrong in assuming that many old firms rest on their laurels. Most of them carry on continuous research, and this, plus experience, gives their products a factor of reliability that must be considered. New ideas, new materials and new firms all play their part, and not all old concerns are progressive. But a low price alone, without experience behind the builder, usually spells disappointment to the buyer.]

MODIFIED LEWIS GEAR TOOTH FORMULA

Accompanying tables on next page

THE commonly accepted Lewis formula, used for the determination of the size of gear teeth, has often been rearranged for the purpose of facilitating its use in practical work. Most frequently charts have been used for the purpose. However, where one wishes to provide a permanent record of the calculations, charts are not so useful and calculations must be written out.

The following arrangement of the Lewis formula has been found advantageous for quick, accurate solution. It minimizes the amount of figuring to be done, therefore reduces the labor of providing the permanent record. The horsepower transmitted by a pair of gears in operation is,

$$hp. = \frac{\text{Tooth pressure } (W) \times \text{Pitch-line velocity } (V) \text{ in ft. per min.}}{33{,}000} \quad (1)$$

The Lewis formula for tooth pressure (W) is, $W = Sp'fy$, in which p' = circular pitch.

For diametral pitch gears, p = diametral pitch and since $p = \frac{\pi}{p'}$

$$W = \frac{\pi Sfy}{p} \quad (2)$$

In which W = tangential tooth pressure in lb.,
S = safe fiber stress in lb. per sq.in.,
f = face width of tooth in in.,
p = diametral pitch,
y = Lewis, "Tooth-form Factor," given in Table I, next page.

It should be noted that the values of "y" to be used are those given for use with tooth dimensions measured in circular pitch instead of diametral pitch. This should cause no confusion if the values of "y" in Table I (next page) are used.

The value of S to be used depends upon the pitch velocity of the gear teeth and the Barth factor is used to obtain the allowable working stress.

$$S = S_o \cdot \frac{a}{a + V} \quad (3)$$

S_o = safe static stress for the material used in the gears. It is usually to be taken at $\frac{1}{3}$ of the ultimate tensile strength of the material in lb. per sq.in.

Combining (2) and (3); $W = \frac{\pi S_o fy}{p} \cdot \frac{a}{a+V}$ (4)

Combining (1) and (4);

$$hp. = \frac{\pi S_o fy \cdot \frac{a}{a+V} \cdot V}{33{,}000\, p} = \frac{S_o fy}{p} \cdot \frac{\pi aV}{33{,}000\,(a+V)}$$

Let $$e = \frac{33{,}000\,(a+V)}{\pi aV} \quad (5)$$

then $$hp. = \frac{S_o fy}{ep} \quad (6)$$

Values of (e) are given in Tables II, next page. They are readily calculated for other values as follows:

$$e = \frac{33{,}000\,(a+V)}{\pi aV} = \frac{33{,}000}{\pi V} + \frac{33{,}000}{\pi a}$$
$$= \frac{10{,}504}{V} + \frac{10{,}504}{a} \quad (7)$$

Although a higher value for "a" of 1,200 is now frequently used for accurately machine-cut gear teeth, the more conservative value of 600, as originally established by Barth, was used in accordance with the following equation for calculating the values in Table II (over).

$$\text{For} \quad a = 600; \quad e = \frac{10{,}504}{V} + 17.5 \quad (8)$$

Solution for gears in train—For calculating purposes, equation (6) is transposed to read

$$\frac{fy}{p} = e \cdot \frac{hp.}{S_o} \quad (9)$$

The horsepower transmitted by a train of gears is practically constant except for the reduction made for each pair of gears to allow for friction losses. If the same material for the gears is used throughout, then $\frac{hp.}{S_o}$ is constant and $hp.$ is constant except for the reduction to be made for each pair of gears, as just mentioned.

The pitch line velocity (V) is the same for a mating pinion and gear but it changes for each pair according to whether the drive steps up in speed or down, as is more often the case. The pitch-line velocity (V) is calculated for each pair of gears and from Table I the corresponding value of "e" is found. Then $\frac{fy}{p}$ equals the product of fixed values, e, $hp.$ and S_o. Oftentimes "p" is assumed. Likewise, the number of teeth may be assumed on account of the gear ratios required for the drive. The width of face (f), the remaining unknown, is thus determined. Should the face width work out to be unsatisfactory, the pitch possibly can be changed or a different material may be selected in order to obtain a more satisfactory width. In case the pitch is changed, the value of both "p" and "y" will change. And if a different material is selected, then "S_o" will change. By an intelligent juggling of these three variables, it is possible to determine the essential elements of a design with a minimum amount of calculation.

It will be seen that if "p" is changed without changing the diameter of the gear, then only "p" and "y" are changed. If only the diameter of the driven gear is changed, then, of course, "e" will not change. However, it will change if the pinion diameter is changed, for then the pitch line velocity will change.

The Lewis Tooth-form Factor: The factors given in Table I (over) are for standard-depth standard-formed involute teeth. This factor, "y," is obtained by considering the gear tooth as a beam, fixed at one end and loaded at the other. Certain designers may find it desirable to use tooth forms other than standard, as for instance long-addendum pinions mating with short-addendum gears. In such cases the values of "y" will have to be determined for the particular tooth forms to be used. On page 264 of Buckingham's "Spur Gears," the graphical method for determining the Lewis Factor for any tooth form is explained.

Contributed by A. C. Rasmussen
Chief Engineer, Insley Division, National Equipment Corporation

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MODIFIED LEWIS GEAR TOOTH FORMULA—Continued

Table I.—"Y" Factors—Lewis Gear Formula

No. of Teeth	20° Std.	Stub	Full Depth Std. Add. 20°	No. of Teeth	20° Std.	Stub	Full Depth Std. Add. 20°	No. of Teeth	20° Std.	Stub	Full Depth Std. Add. 20°
	⅛	¾			⅛	¾			⅛	¾	
10	.080	....	....	26	.133	.139	.117	50	.150	.156	.134
11	.090	....	....	27	.135	.140	.118	55	.152	.157	.136
12	.097	.102	.078	28	.136	.141	.119	60	.153	.159	.137
13	.102	.107	.084	29	.137	.142	.120	65	.154	.150	.138
14	.107	.112	.089	30	.138	.143	.121	70	.156	.161	.139
15	.110	.115	.093	31	.139	.144	.122	75	.157	.162	.142
16	.114	.119	.096	32	.140	.145	.123	80	.158	.163	.142
17	.116	.122	.099	33	.141	.146	.123	90	.159	.165	.143
18	.119	.124	.101	34	.141	.147	.124	100	.160	.166	.144
19	.122	.127	.104	35	.142	.147	.125	125	.162	.168	.145
20	.124	.129	.106	36	.143	.148	.126	150	.164	.170	.147
21	.126	.131	.109	37	.144	.149	.127	175	.165	.171	.148
22	.127	.133	.110	38	.144	.150	.128	200	.166	.172	.149
23	.129	.134	.111	39	.145	.151	.128	250	.168	.174	.150
24	.130	.136	.113	40	.145	.151	.129	300	.170	.176	.151
25	.132	.137	.116	45	.148	.154	.132	Rack	.174	.179	.154

Table II.—Values of "e" $\left(=\frac{10504}{V}+17.5\right)$ V = pitch-line velocity, ft. per min.

V	e	V	e	V	e	V	e	V	e	V	e	V	e
25	438	50	228	75	158	100	123	130	98	189	73	344	48
26	422	51	224	76	156	101	122	132	97	193	72	356	47
27	407	52	220	77	154	102	121	134	96	196	71	369	46
28	393	53	216	78	152	103	120	136	95	200	70	382	45
29	380	54	212	79	151	104	119	137	94	204	69	396	44
30	368	55	209	80	149	105	118	139	93	208	68	412	43
31	356	56	205	81	147	106	117	141	92	212	67	429	42
32	346	57	202	82	146	107	116	143	91	217	66	447	41
33	336	58	199	83	144	108	115	145	90	221	65	467	40
34	326	59	196	84	143	109	114	147	89	226	64	489	39
35	318	60	193	85	141	110	113	149	88	231	63	512	38
36	309	61	190	86	140	111	112	151	87	236	62	539	37
37	301	62	187	87	138	113	111	153	86	241	61	568	36
38	294	63	184	88	137	114	110	156	85	247	60	600	35
39	287	64	182	89	136	115	109	158	84	253	59	637	34
40	280	65	179	90	134	116	108	160	83	259	58	678	33
41	274	66	177	91	133	117	107	153	82	266	57	724	32
42	268	67	174	92	132	119	106	165	81	273	56	778	31
43	262	68	172	93	130	120	105	168	80	280	55	840	30
44	256	69	170	94	129	121	104	171	79	288	54	93	29
45	251	70	168	95	128	123	103	174	78	296	53	1000	28
46	246	71	165	96	127	124	102	177	77	304	52	1106	27
47	241	72	163	97	126	126	101	180	76	314	51	1236	26
48	236	73	161	98	125	127	100	183	75	323	50	1401	25
49	232	74	159	99	124	129	99	186	74	333	49	1616	24

Values in this table are for "a" = 600.

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SHOP EQUIPMENT NEWS

Niagara No. 512 Single-Crank Press

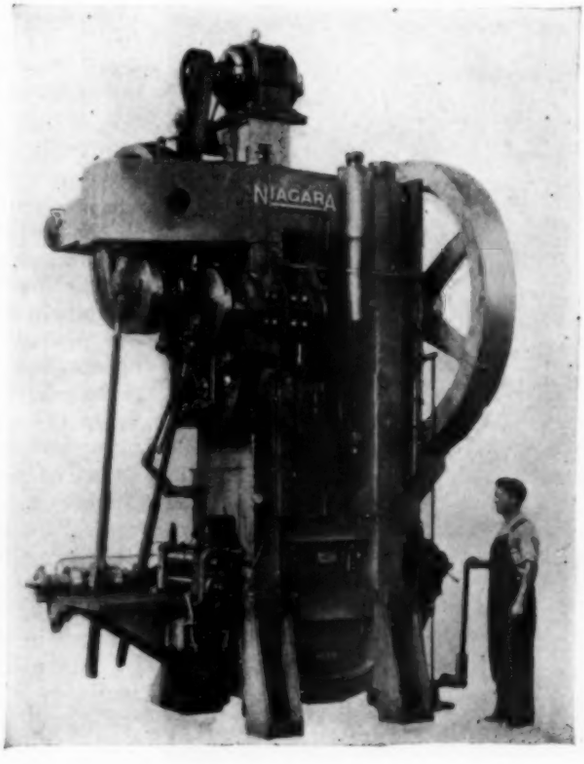
A large single-crank press, equipped with a special two-increment roll feed, has been developed by the Niagara Machine & Tool Works, Buffalo, N. Y. Specifications for this press required the punching of a predetermined number of groups of holes in strip stock, the distance between the groups to be uniform, but the space between the last group and the end of the sheet to be greater. This necessitated, after the last stroke, an automatic change in the feed from the standard increment to a longer one.

The strip stock is of considerable width and is previously cut to the correct length. A strip is inserted between the roll feed and through the opening in the press housing at the right. After the clutch is engaged, the required number of perforations evenly spaced are produced automatically. Then the long feed comes into action and not only feeds the necessary, broad unpunched area at the end of the strip, but carries the last edge of the strip clear of the left-hand roll feed. The press then stops.

In order to maintain high production, the press is single geared and operates 42 strokes per min. For maximum strength and rigidity, the press has straight uprights rather than being of the gap type. The crown, uprights and bed are rigidly tied by large steel tierods shrunk in place. The considerable width of the strip stock necessitated special large openings in the uprights.

The slide is guided by long gibs and is spring counter-balanced, the springs being completely inclosed in steel cylinders. Motion of the slide is controlled by a full-automatic, multiple-disk friction clutch, which may be operated by hand or foot. The friction clutch is built into the flywheel, which is equipped with anti-friction bearings. The bearings for the drive shaft are bronze bushed. When operating with the roll feed, the press may be stopped at any time by an emergency hand control.

The brake is released automatically when the clutch is engaged and is again applied to stop the press when the clutch is disengaged. The brake shoes are self-aligning, and being actuated by powerful toggle levers the braking effect is positive. The brake mechanism is a separate unit and is mounted at a considerable distance from the clutch, so that no heat from the brake is transmitted to the clutch. All gears are generated to give quiet transmission of power. The press is arranged for belted motor drive.



"United" High-Speed Bench Drill

High-speed drilling of small holes from 0.006 to $\frac{1}{4}$ in. can be done on the bench drill announced by the United Engine & Machine Company, San Leandro, Calif. Both the motor

and rotating parts of the drill press are carried on ball bearings. Lubrication of the spindle is accomplished through two oil cups. From these oil cups the oil drops by gravity through a series of wells, from which centrifugal action forces it throughout the interior of the quill and back to the reservoirs.

The upper head of the drill press is attached to a $2\frac{1}{4}$ in. column and can be swung on the column for the full 360 deg. It can also be dropped

to the extreme bottom of the fish plate by means of a gear rack. The head may also be removed from the column and attached to any similar column in combination with other drill heads to provide for multiple-spindle drilling.

The spindle is supported on ball bearings guaranteed to stand operation at 20,000 r.p.m. The spindle is driven through an endless belt by a ¼-hp. motor. It has a travel of 3 in., and the standard speeds are 5,000, 7,500 and 10,000 r.p.m. under load. The machine is also available for maximum speeds of 5,000 and 15,000 r.p.m.

Specifications: capacity, ⅜ in.; spindle taper, No. 1 Morse; distance from center of spindle to column, 6½ in.; spindle speed, 5,000, 7,500 and 10,000 r.p.m.; vertical travel of quill, 3 in.; travel of head, 7½ in.; vertical travel of table, 11 in.; maximum distance of table from spindle, 13 in.; table diameter, 6 in.; rectangular table dimensions, 12x12½ in., and weight, without motor, 100 lb.

Barrett Centrifugal Machines for Washing, Drying and Painting Operations

Various processing operations can be undertaken with the centrifugal machines built by the Leon J. Barrett Company, Worcester, Mass., by employing a proper bowl or container. The processes that can be performed include washing, drying, extracting, coating, saturating and impregnating of small parts and articles. It is not so much the weight of the article as its dimensions and the bowl capacity that limit the processing operations. The action of the machine depends upon a reasonable balance, because the container must revolve the contents at a high rate of speed on a spindle yielding but slightly from the vertical. The method of sustaining the basket in the vertical position is partly gyroscopic and partly mechanical. A load will assume a running balance at the center of gyration and run fairly smoothly even when the spindle wobbles around the perpendicular, a condition occasioned by as much as 20 lb. or more out-of-balance. Heavy-duty models are capable of handling heavy articles provided they can be whirled in fair balance. The centrifugal "Filwhirl Enameler," trade name for one model, will coat a wide variety of articles of wood, fiber, or metal, weighing from a fraction of an ounce to several pounds. The saving in time, evenness of the coating, and freedom from drippings and thick spots, together with bulk handling, permit economical finishing. Articles are placed in the container and the coating materials enter the machine through a valve. The parts are immediately and completely coated. Any excess material is thrown off, leaving only the desired even thickness of covering. Threads in tapped holes do not clog. The process also overcomes the difficulty of covering inside of hidden areas. No dripping of parts is encountered after leaving the machine. The coating material may be run into the machine either hot or cold, and the excess is returned to the supply tank, no material being wasted.

The centrifugal hydrostatic impregnator for wood, electrical coils and fabrics operates in the same manner as the previous machine, except that the bowl or container is changed. Articles to be impregnated are positioned and submerged in the impregnating fluid within the closed bowl or container, which is then rotated at a given speed. Centrifugal force acting radially from the axis of rotation forces the liquid against the wall of the container, thus building up and maintaining the maximum hydrostatic pressure at the largest diameter or at the solid rim, the pressure decreasing inwardly with reduction of diameter of the whirling mass toward the center. Thus, with a 24-in. bowl running at 1,200 r.p.m., fluid tight except for a 4-in. hole at the middle of the top, and containing a liquid the specific gravity of which would develop and maintain 90 lb. hydrostatic pressure at the bowl rim, would have a hydrostatic pressure of 34 lb. at a 14-in. diameter and 0 at a 4-in. diameter, or the inner surface of the liquid wall. The hydrostatic pressure is calculable for any diameter. As rotation is continued the liquid is forced completely through the article toward the center at a rate depending upon the speed of rotation, the radius of the basket, the density of the liquid, and the permeability of the article. As the impregnation progresses any air therein would be literally squeezed out toward the low-pressure center opening, so that no air pockets form to interfere with the process.

On these machines the entire rotating unit is positioned on a ball and socket universal in the base, so designed as to sway under complete control about a vertical axis. This design confines pulsations to the container, focusing and diminishing vibrations so as to be absorbed through the ball in the base. The amplitude of these oscillating movements, which is always in evidence and caused by variable or unequally distributed loads, will cause the articles in the

container to be subjected to a pulsating pressure due to the variance of the hydrostatic pressure at different diameters. Such pulsations give decided impetus to the penetrating effect of the liquid on the articles. Coils, difficult to impregnate, are completely impregnated in three minutes.

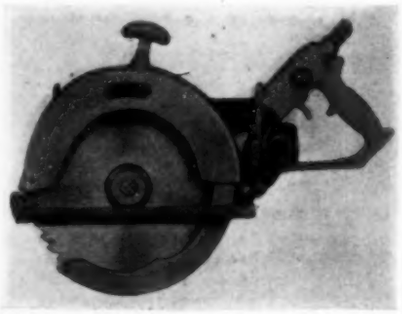
"National-Cleveland" Side-Milling Cutters

Die-forged, high-speed-steel, side milling cutters with unfinished web recesses are being offered to the trade by The National Tool Company,

Cleveland, Ohio. All standard sizes from 3 in. outside diameter up can be shipped from stock or quickly made up. The milling cutters are die-forged from billets.

"U. S." Portable Saw

A portable electric hand saw is now being announced by the United States Electrical Tool Company, Dept. 44, 2490 West 6th St., Cincinnati, Ohio. This saw will do several types of sawing—cross, rip, plane, rafter, bevel cutting and pocket cutting on stone and slate. Two adjustments set the saw for any depth and for any angle through 60 degrees. A patented beveling device does away with the need for a try-square. A clear-vision blower keeps sawdust away from the markings. Top and automatic bottom guards protect the operator in every working position.



This saw makes use of ball bearings on all models. A special heat-treated, double-reduction gear assures long life. The saw is made for depths of $1\frac{7}{8}$, $2\frac{3}{8}$, $3\frac{1}{16}$, $3\frac{9}{16}$ and $4\frac{1}{8}$ in. The largest size weighs $26\frac{1}{4}$ lb.

Euclid Type 12 Electric Hoist

Four sizes of the Type 12 hoist are being manufactured by the Euclid-Armington Corporation, Euclid, Ohio. These sizes are $\frac{1}{2}$-, 1-, 2- and 3-ton capacities. Every shaft in these hoists rotates on Hyatt heavy-duty, heat-treated bearings. The standard 1-ton model brings the hook to within 18 in. of the underside of the I-beam, no matter whether the drum is at right angles to or parallel with the track

Where extremely low headroom is found, a special hoist is available in which the hook can be brought to within $8\frac{1}{2}$ in. of the underside of the beam.

No frictional resistance is imposed by the load brake while hoisting, yet the load is under positive control at all times. The brake is set automatically when the hoisting motor is stopped. The load can be lowered only by reversing the motor. An improved motor brake is also applied to the hoist to stop the motor instantly when the controller is turned to the neutral position. The hook block is fully inclosed and all gears are of the wide-face, coarse-pitch type.

Société Genevoise Micrometer Microscope

A micrometer microscope for the checking and control of small manufactured pieces, or for precision measurements on standard scales or circular divisions, has been introduced into the United States by the R. Y. Ferner Company, Investment Building, Washington, D. C. The instrument is manufactured by the Société Genevoise d'Instruments de Physique, Geneva, Switzerland, and is known as the Model 281-D. It may be used for checking the profiles of small gears or screw threads, or for measurements of fine wires, jewel bearings and diamond dies.

The micrometer screw is made of a special heat-treated steel, fitted and lapped into the bronze nut. The thrust bearing of the screw is a sapphire ground optically flat to eliminate periodic error and insure accurate working of the screw. A counteracting spring eliminates play.

In the micrometer drum a white material is used for the graduated surface to make for easy reading, and the drum is accurately graduated on a circular dividing machine. The divisions permit estimates of a tenth

of a division, or 0.000005 in. A glass turn counter in the field of the eyepiece is so graduated that to obtain the complete reading it is merely necessary to set down successively the numbers indicated on the turn counter and the micrometer head.

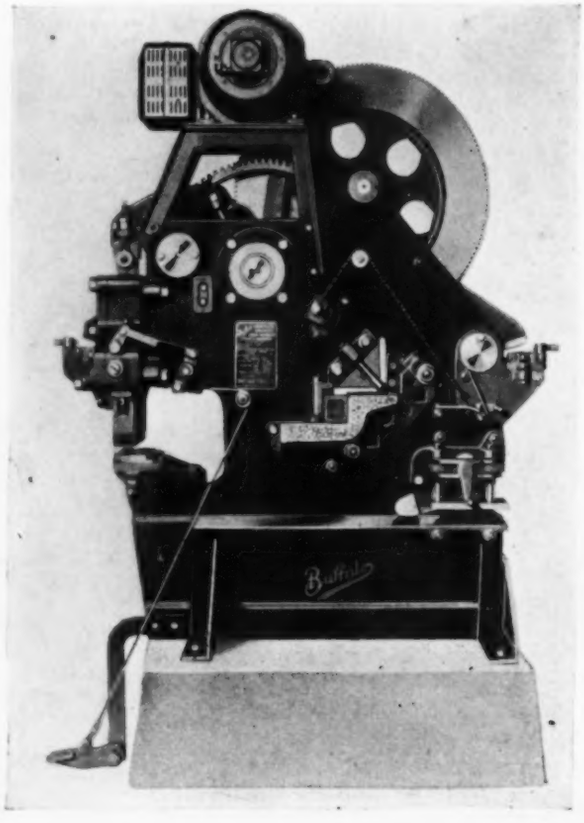
An unusual mounting of the eyepiece is placed on a small carriage, which slides in the top of the micrometer box by means of a rack and pinion. This permits placing the eyepiece over the center of the part of the field in which the measurements are made, to reduce distortion of the image, which is primarily corrected by the achromatic lenses of the eyepiece. Illumination is furnished by a miniature Osram lamp. The total magnification is 41.5 times for the instrument (281-D). The 286-D has a magnification of 63 times and the 287-D, 96 times.

The stand for the 281-D instrument is rigidly constructed, and the table is $2\frac{3}{4}$ in. in diameter. Working distance of $3\frac{7}{16}$ in. from the center of the table to the edge of the supporting arm is provided.

"Buffalo" Universal Iron Workers with Built-In Notcher and Coper

Seven distinct operations are now possible on the "Universal Iron Workers" built by the Buffalo Forge Company, Buffalo, N. Y. These operations are punching, bar shearing, angle shearing, angle mitering, plate slitting, coping and notching. Both the notching and coping operations can be done without changing tools. One end of the machine has a built-in notcher, whereas the other end (shear end) permits the use of a coper or notcher interchangeably. Frames are made of electrically-welded "Armor-Plate" steel, guaranteed against breakage.

For shops that use the punch more extensively than the bar-cutter and shear sections, the 90-deg. notching tools are now furnished on the shear end instead of in the punch head. Square coping tools can be furnished on the shear end only, and are interchangeable with the 90 deg. notching device. While the tool changes require 15 min. only, it is of advantage to have the square coper on the shear end and the 90-deg. notcher in the punch head, so that there is no time lost for tool changes. The 90-deg. notcher will also cope the ends of beams and channels (flanges only) or angles and tees square by inserting the material diagonally. Suitable stops are provided for either square coping at the ends, or 90 deg. "V" notching in the center. For both operations, the material is fed into the dies without tilting, making it easy for the operator to cut on the line.



The two supports for the dies of the notchers and copers are welded to the frames.

The machines are available in three sizes: No. 0, $\frac{1}{2}$ and $1\frac{1}{2}$, having punch capacities of $\frac{3}{4}$ x $\frac{3}{8}$ in., $\frac{7}{8}$ x $\frac{5}{8}$ in., and $\frac{7}{8}$ x $\frac{3}{4}$ in. The motors supplied are of 2, 3 and 5 hp., respectively.

Brown & Sharpe Cutter Adapters, End Mills and Arbors

The Brown & Sharpe Mfg. Co., Providence, R. I., has recently announced several cutter adapters, spiral two-lipped end mills, arbors for shell end mills and screw arbors for use with these adapters.

The adapters are furnished in two

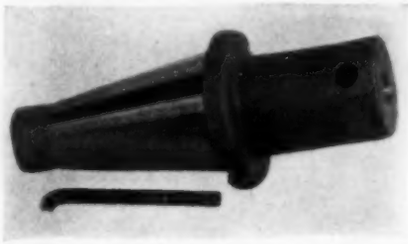


Fig. 1—Brown & Sharpe Cutter Adapter for use on milling machines having standardized spindle end, to accommodate end mills having milling-machine standard taper shanks

Fig. 2—Brown & Sharpe Cutter Adapter for milling machines having standardized spindle end, to accommodate end mills having milling-machine standard taper shanks

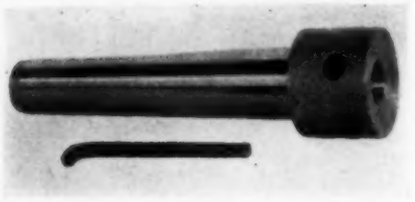


Fig. 3—Brown & Sharpe Cutter Adapter for milling machines having either a taper- or threaded-nose spindle, to accommodate end mills having milling-machine standard taper shanks

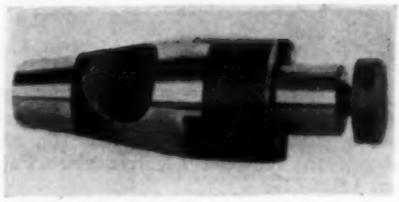


Fig. 4—Brown & Sharpe Arbor for shell end mills

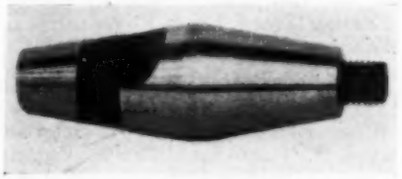


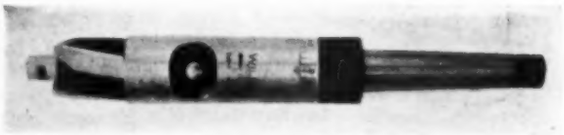
Fig. 5—Brown & Sharpe Screw Arbor for use with cutter adapters having a No. 30 milling-machine standard taper hole

Fig. 6—Brown & Sharpe Spiral, Two-Lipped End Mill with milling-machine standard taper shank

different styles for use with milling machines having standardized spindle ends, and also in one style for use on milling machines having a taper or threaded-nose spindle. The adapters are furnished with a milling machine standard taper hole into which the shank of the end mill or arbors fit and is held securely to its seat by a cam furnishing a positive drive. The surface of the cam engages the flat surface of the groove in the shank of the cutter, so that when the cam is turned to release it the cutter or arbor drops from the adapter, the steep taper preventing sticking and insuring quick release. The tools are supplied in a range of sizes.

Wilder Adjustable-Length, Quick-Change Toolholder

Designed for multiple-spindle operation of counterboring, core drilling, countersinking, hollow milling and combination multi-diameter, one-operation tools, an adjustable-length, quick-change toolholder has been placed on the market by The Wilder Tool Company, Greenfield, Mass. The above tools are interchangeable in a holder of a given size, including the company's standard line of quick-change holders and chucks. The holders are made of alloy steel, hardened and ground for size, and tools can be guided from the outside diameter through guide bushings or from the end of hardened and ground removable pilots. The minimum length of adjustment is $\frac{3}{32}$ in., and the maximum length, $1\frac{3}{4}$ in., depending on the length of holder required. This adjustment is made direct by thousandths. To increase the length, the knurled barrel is turned clockwise for the required amount.



Wilder Adjustable-Length Quick-Change Toolholder

"R-S" Improved Type C Electric Rivet and Small Parts Heating Furnace

Several improvements have been made in the "R-S" electric rivet and small parts heating furnace, type C, as announced by the Ryan, Scully & Company, 3711 Wissahickon Ave., Philadelphia, Pa. Although originally developed for heating of alloy rivets, with the introduction of the high-temperature Globar unit, the furnace in high-temperature models is suitable for heating small quantities of stock for forging. The high-temperature unit permits accurate heat-treatment with a minimum of temperature gradient.

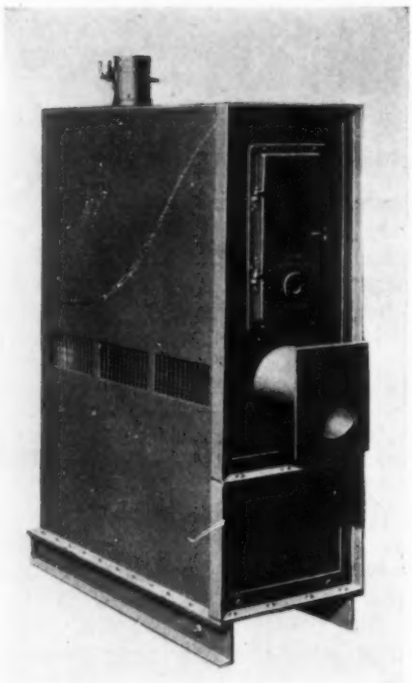
All furnaces of the lower temperature rating are supplied with a metal hearth plate split in two sections. This allows for one charge being worked in one side without affecting the heated work in the other section, and one side can be worked free of the charge while the other is coming to temperature. Because of the heavier cross-section of the carborundum refractory that must be used in the high-temperature furnace, the double-channel hearth is furnished only in the larger width. The door is of the split type, operating on rollers with hand lever control.

The low temperature furnaces are supplied with metallic resistors spaced under the hearth and on the side walls. The high temperature units are equipped with Globar elements mentioned previously.

The low-temperature furnaces are available for temperatures up to 2,000 deg. F., in four sizes, and the high-temperature furnaces for work up to 2,500 deg. F., in three sizes. For the low temperature furnaces the working dimensions range from $5\frac{3}{8}$x 6x18 in. to $7\frac{3}{8}$x10x30 in. For the high-temperature furnaces the working dimensions range from $6\frac{1}{2}$x5x 10-in. to $5\frac{1}{2}$ in. each side x6x23 in.

"Dry-Sys" Type L Indirect, Gas-Fired Heater

To replace or supplement existing steam or other heating equipment, Drying Systems, Inc., 1800 Foster Ave., Chicago, Ill., is announcing a Type L indirect, gas-fired heater. This heater can be used in practically any arrangement for fan blast work. An interior-fired type of heater is employed, eliminating the necessity of a fire-brick combustion chamber, and the heater can be shipped complete ready for easy assembly into sections and quick attachment of gas manifolds, temperature controls, and safety devices. The heater can be used for space heating, or in con-



"Dry-Sys" Type L Indirect Gas-Fired Heater in the three-tube high model

nection with drying operations. In conjunction with the Dry-Sys humidifying equipment, it can be used in connection with combined air conditioning and heating problems.

The type L heater is built in two standard sizes, three-tube or five-tube high. Increased capacity can be obtained by adding additional heater sections.

PATENTS

JULY 21, 1931

Metal-Working Machinery

Work Size Mechanism for Grinding Machines. Raymond A. Cole, Worcester, Mass., assigned to Norton Co. Patent 1,815,940.

Centrifugal Tube-Casting Apparatus. Isidoro Bignami, Ercole Galassini, Emilio Franchi, and Giulio Pons, Brescia, Italy, assigned to Societa Alti Forni, Fonderle, Acciaierie E. Ferriere Franchi-Gregorini, Brescia, Italy. Patent 1,815,093.

Machine for Bending Sheet Metal. Robert M. Hinrich, Detroit, Mich., assigned to Drake-Avery Co. Patent 1,815,102.

Lapping Machine. Samuel Holt, Ridgewood, N. Y., assigned to Norton Co. Patent 1,815,104.

Tool Grinding Machine. Kurt Metzler, Grossenhain, Germany. Patent 1,815,112.

Axle Press. Claude C. Bennett, Seattle, Wash., assigned to A. E. Feragen, Incorporated. Patent 1,815,180.

Die-Sinking and Engraving Machine. John E. Johnson, Aurora, Ill. Patent 1,815,204.

Feeding Mechanism for Grinding Machines. Einer William Larsen, Chicago, Ill., assigned to Western Electric Co. Patents 1,815,262 and 1.815.263.

Electric Soldering Means. John A. Toleik, West Orange, N. J., assigned to American Can Co. Patent 1,815,280.

Method and Apparatus for Grinding Gears. Bernard E. Shlesinger, Irondequoit and Thomas M. Durkan, Rochester, N. Y., assigned to Gleason Works. Patent 1,815,336.

Overload Release Mechanism. Howard D. Colman, Rockford, Ill. Patent 1,815,345.

Broaching Machine. Louis H. Blood, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co. Patent 1,815,647.

Die Casting Machine. Alvin Simeon Kipp, Madison, Wis., assigned to Madison - Kipp Corporation. Patent 1,815,776.

Tools and Attachments

Apparatus for Making Pipe Couplings. John Lamond, Allison Park, Pa., assigned to Pittsburgh Pipe & Coupling Co. Patent 1,815,107.

Grinding Wheel. Thure Larson and Hugo W. H. Beth, Worcester, Mass. Patent 1.815,108.

Saw Gage. Alfred M. Remington, Fitchburg, Mass., assigned to Simonds Saw & Steel Co. Patent 1.815.215.

Method of Making Milling Cutters. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works. Patent 1,815,324.

Strap Clamp and Block. Robert W. Lord, Portsmouth, N. H. Patent 1,815,414.

Apparatus for Slitting Metal Sheets. Thomas A. Sindelar, Canton, Ohio, assigned to Republic Steel Corporation. Patent 1,815,487.

Follow Rest. Constant Bouillon, Torrington, Conn., assigned to The Hendey Machine Co. Patent 1.815.490.

Tool. John Milton Luers, Detroit, Mich. Patent 1,815,518.

Hydraulic Chuck. Louis E. Gofriaux, Madison, Wis., assigned to Gisholt Machine Co. Patent 1,815,562.

Stock Bar Feeder. Ralph J. Miller, Madison, Wis., assigned to Gisholt Machine Co. Patent 1,815,574.

Chuck. Axel W. Bjorkman, Brooklyn, N. Y., assigned to Otis Elevator Co. Patent 1,815,609.

Nonjamming Taper Shank Tool. Ray W. Brown, Altadena, Calif., assigned to Henry Dalzell Wilson. Patent 1,815,611.

Apparatus for Positioning and Holding Work for Material Working Apparatus. Walter Bonsor, Oak Park, Ill., assgned to Western Electric Co. Patent 1.815,699.

Apparatus for Measuring Variations in Thickness of Metallic Bodies. Hermann Ernest Kranz, Berwyn, Ill., assigned to Western Electric Co. Patent 1,815,717.

Apparatus for Cutting Metal and Other Materials. Joseph Jamieson, Belmain, near Sydney, New South Wales, Australia. Patent 1,815,736.

Boring Tool. James Roy Aulenback, Worcester, Mass. Patent 1,815,756.

Processes

Chromium Plating. Erwin Sohn and Ralph J. Paddock, Bellevue, Pa., assigned to Standard Sanitary Mfg. Co. Patent 1,815,081.

Method of Casting Metals. Henry L. Coles, Hamilton, Ohio, assigned to Guardian Metals Co. Patent 1,815,186.

Bushing Bearing and Method of Making It. Joseph Brincil, Reading, Pa. Patent 1,815,344.

Method and Apparatus for Casting Metals. Albert Wood Morris, Drexel Hill, and Samuel Price Wetherill, Jr., Haverford, Pa., assigned to Wetherill-Morris Engineering Co. Patents 1,815,-360 and 1,815,361.

Bright Annealing of Metals. Robert G. Guthrie and Oscar J. Wozasek, Chicago, Ill., assigned to Peoples Gas By-Products Corporation. Patent 1,815,505.

Method of Finishing Spline Shafts. Charles L. Lee, Dayton, Ohio and Claude H. Sterling, Detroit, Mich., assigned to General Motors Research Corporation. Patent 1,815,625.

Process of Plating Metal. William E. Watkins, New York, N. Y., assigned to Copper Plate Sheet & Tube Co. Patent 1,815,638.

TRADE PUBLICATIONS

CLUTCHES. The Carlyle Johnson Machine Co., Manchester, Conn., is now distributing its Super-Johnson catalog, featuring the improvements and advantages of its new Super-Johnson Clutch. In this new type of clutch, the expanding friction ring is faced on its outside diameter with a special heat-resisting material.

SAFETY. The National Safety Council, Inc., 20 N. Wacker Drive, Chicago, has issued Industrial Safety Series No. Me3 on "Safety in Structural and Sheet Metal Fabrication." This 16-page pamphlet was prepared in cooperation with the American Society of Safety Engineers. It describes the type of work and the machinery used in such shops and how accidents happen, as well as recommending the correct procedure for each class of work.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, July 30, 1931

VOL. 75 NO. 5

To Provide Work on a Sound Basis

Enthusiasm and sentiment lead us into strange practices. The dumping of the contents of office letter files on the floor in order to provide work for clerks shows not only a soft heart but a head that borders on the same condition. If "making work" is a factor of sound economics then our inventors are public enemies and our labor-saving machinery a menace to mankind. If work alone is desirable rather than securing the greatest product from a minimum of labor, then the antiquated methods of Chinese agriculture are more to be desired than the tractor and the combination reaper and thresher.

Without attempting to be specific we know that distribution has not kept pace with production. A huge wheat surplus and hungry people show a slip in the cogs of business, and one that cannot be lightly brushed aside. But while the captains of business are determining how the faults of the past can be remedied ways must be found of giving employment on useful work, not on unsound economic makeshifts.

If our system is to continue, and it is, we must increase our efficiency in manufacture. We must be ready to produce at even lower costs as soon as distribution begins to function normally once more. Instead of doing needless work in refiling letters, the office manager should replace his worn typewriters and other office machinery with the best obtainable. It would be just as cheap, and make for a better feeling, to give the filing clerks an extra vacation, with pay.

Government offices should follow suit by installing modern equipment. Such Navy yards and arsenals as are to be retained should be modernized. Railroads might well be financed if necessary to hasten the elimination of obsolete machinery. For, as recently pointed out by the *Railway Age,* railroads are likely to be forced to increase net earnings by economy of operation rather than by larger revenues. Some of those with modern motive power and whose shops are now well equipped are earning their dividends in spite of the depression.

Useless work is uneconomical from every point of view and approaches the dole more nearly than many seem to think. It distributes surplus just as effectually as unemployment insurance and it is doubtful if the effect of labor that is known to be unnecessary, is very different from receiving a bonus in the form of a vacation with pay.

Money properly spent in improving equipment is an investment, not an expenditure. What we need is some definite plan that will start such a movement—now. Governmental industries, such as Army, Navy and printing could inaugurate such a movement. Railroads, being semi-public and vital necessities, could well be assisted in this movement where necessary. The improved business resulting from such a plan would not be confined to the machine building industry but would be widely extended. Let us have a plan and follow it.

Standards of Quality Are Needed

Disheartening competition and wide discrepancies in estimates and prices can frequently be traced to the lack of a yardstick, or standard, by which the products or services can be compared. Widely varying bids for machinery or material are often the result of differences that do not appear on the surface, as well as of inadequate or misleading methods of cost accounting.

Large public utility companies are finding it to their advantage to educate their smaller competitors in the matter of standards of service in order to prevent competition that is unfair to the smaller company and to the consumer, as well as

to themselves. Machine builders, whether regular manufacturers or makers of special equipment, or even engaged on large repair work, might well consider the advisability of standards which would put everyone on an equal basis and benefit the consumer as well.

Materials are now well standardized and can be specified. The grade of fits can be designated by reference to adopted standards. Finish of surfaces is a more difficult matter, but R. E. W. Harrison has made an excellent beginning so far as ground surfaces are concerned.

While many concerns have done excellent standardization work on their own products, it is evident that in the matters here referred to the standards must be generally recognized by both manufacturers and consumers. Such standardization should help not only the industry itself but all users of its products, which means nearly all other industries as well.

◂◂ CHIPS ▸▸

As this is written it is expected that U. S. Steel will reduce dividend rate and possibly wage and salary rates at July meeting. . . . Such action, particularly the second part of it, will be unfortunate because of Steel's bell wether position. . . . In view of strong public statements by Steel executives, there may be some explanations, even though action is in line with what has been considered "good business."

Unexpectedly large attendance, four times estimated number of machine tool buyers, at Kearney & Trecker show, temperature 100 degrees plus, gives some indication of what may happen when equipment orders are released. . . . Good grounds for believing that recovery will be rapid. . . . Also one indication that boom may get dangerously out of control if circumstances conspire.

Control of future transoceanic airship service through U. S. monopoly of helium gas is proposed. . . . Proponent foresees devastating rate wars like those that have plagued steamship companies and would avoid them. . . . Optimists are not all dead yet.

C. S. Eaton resigns from Youngstown board, merger talk revives. . . . E. J. Mehren, McGraw-Hill vice-president, becomes president of sorely troubled Portland Cement Association; presidency is now a full-time job, and a man's-sized one. . . . C. M. Schwab buys back into Stutz. . . . Professor Dudley of Yale joins Westinghouse Air Brake as advisor.

National Industrial Conference Board finds that nearly one half of what the Census calls "value added by manufacture" is represented by salaries and wages. . . . In 1929 nearly twenty-five per cent of this sum went for salaries, in 1923 it was twenty per cent. . . . Change reflects developments in factory control, and higher overhead.

Britain sells half million dollars' worth of machinery daily to U.S.S.R.; conservatives question government credits to aid in financing. . . . General Motors reports second quarter net $1.22 a share, $1.17 last year. . . . Dollar volume of failures declines. . . . Rochester clothing workers being recalled rapidly. . . . Large maker of industrial sewing machines reports activity.

MORE BOOKS

A foreign publisher has discovered the reason for the "decadence" of our industry and engineering. Our largest firm of technical book publishers lists but a paltry eight hundred odd titles. His firm boasts of nearly four thousand. How can a nation that won't write more books of a technical nature hope to survive? He neglected to say who would read them, nor whether their publication would be profitable. But perhaps he works under an endowment that frees him from such practical annoyances.

"Your editorial on 'Training Programs,' (*AM*—Vol. 74, page 814) refers to the attitude of employers in discontinuing apprenticeship during dull times as 'one more indictment of our system of business management.' There may be circumstances in times of stress that force this policy on some managers, but what are we to think of the attitude of boys and their parents who turn away from apprenticeship in these same dull times?

"When there is a large amount of unemployment among the unskilled, the semi-skilled and even among the highly educated who have not yet learned a specific work where their services are demanded, it would seem that any intelligent boy or parent would be on the lookout for vocations in which work was likely to be more con-

tinuous. There is no guarantee that graduates of apprentice programs will have any steadier work than others, but of the boys who did satisfactorily with us as apprentices, I have not heard of one who has been unemployed this past year. Of course that does not mean much, as the numbers are few, some have not been heard from, and it may only be that the kind of boy that makes good as an apprentice is the kind that will have steady employment in any case. But we can at least say that every boy and every parent should consider apprenticeship.

"Observation shows just the opposite of what we would expect. When business is rushing there are a reasonable number of boys looking for opportunities. In dull times there are far less applicants among the boys, and those that do come are looking for immediate work, not for apprenticeship. The more conspicuous the need of learning vocations in a broad and thorough manner, the less boys show their desire to do so. This last year has produced the low mark, a year without a single application for our regular apprenticeship. The opportunities with us were mentioned twice in Worcester's leading daily paper, but these two statements did not produce a single inquiry. Not one parent was sufficiently interested to look into it.

"When business improves and a shortage of labor develops, then it may be possible again to secure competent boys as apprentices."

—A. W. Forbes,
Forbes & Myers.

THIS WEEK AND NEXT—IN *AM*

No one knows better than the manager of a small shop that his problems call for genuine versatility and an uncanny ability to be in three or more places at once. In the leading article this week R. H. Ure, of London, England, shows how such a manager can organize his work for maximum effectiveness (page 193). The Chrysler Imperial cylinder block line is shown and described pictorially (page 196).

What is really going on in Russia? Millions of words have been written in attempted answer to the question, but few of the writers have been in a position to uncover the facts. Walter N. Polakov, consulting engineer to many of our greatest American corporations, was born and brought up in Russia, knows the language, knows the people. After twenty-five years as an American citizen, he was asked to become consultant on management to the Supreme Economic Council of the U. S. S. R. He has been in the best possible position to see what has been going on for the past two years. What he has to say about the Five Year Plan should be read most thoughtfully (page 215).

Next week Ken G. Niblack, of Bausch and Lomb, will begin an authoritative serial, "Optics in Metal Working." C. J. Dorer, chief tool designer, White Sewing Machine Corporation, will give us the benefit of his long experience in "Refinements in Die Practice."

• MEETINGS •

The Industrial Institute
Round table conferences, Silver Bay on Lake George, N. Y., Aug. 10-25. Charles R. Towson, secretary, 347 Madison Ave., New York, N. Y.

International Industrial Relations Congress
Amsterdam, Holland, Aug. 23-29. Information from Mary van Kleeck, Russell Sage Foundation Bldg., New York, N. Y.

Society of Automotive Engineers
National aeronautic meeting, Sept. 1-3, Hotel Statler, Cleveland. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

International Association for the Testing of Materials
First Congress, Sept. 6-12, Buildings of the Swiss Federal Polytechnicum, Zurich, Switzerland. C. L. Warwick, secretary-treasurer, A.S.T.M., 1315 Spruce St., Philadelphia, Pa., or W. H. Fulweiler, A.S.T.M. representative on the Permanent Committee, Chemical Engineer of the United Gas Improvement Co., Philadelphia.

National Metal Congress and Exposition
Exposition on Commonwealth Pier and Congress sessions at Hotel Statler, Boston, Mass., week of Sept. 21. Meetings of American Welding Society and American Society for Steel Treating in connection. Information from W. H. Eisenman, secretary A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio.

Society of Automotive Engineers
National production meeting, Detroit, Mich., Oct. 7-8. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

Society of Industrial Engineers
Annual meeting, Pittsburgh, Pa., Oct. 14-16. George C. Dent, secretary, 205 W. Wacker Drive, Chicago, Ill.

National Safety Council
Twentieth Annual Safety Congress, Chicago, Ill., Oct. 12-16. W. H. Cameron, secretary, 20 North Wacker Drive, Chicago.

Gray Iron Institute
Fourth annual convention, West Baden Springs Hotel, West Baden Springs, Ind., Oct. 15-16. J. Arthur Tuscany, secretary, Terminal Tower Bldg., Cleveland.

American Management Association
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Oct. 21-23. Headquarters, 20 Vesey St., New York, N. Y.

Progress in Metal-Working and Machinery Markets

ANTICIPATIONS of a definite step-up this fall relieve worse-than-usual summer stagnancy in machinery and machine tool markets. A few sections note an upturn in orders, but most had a very slow July, although inquiries are reawakening interest. Most prospects await results of what is happening at Detroit and in Europe, seeking, as they have been for months, some indication of leadership on the part of someone else while hesitating to take it themselves.

NEW YORK awaits awarding of the 17-lathe Navy order and the filing of the subway list. School lists are important there nowadays. Cleveland reports sales at the year's lowest, but expects a gradual upward swing by September and expects several important lists by that time. Chicago has an undercurrent of optimism, but few orders to substantiate it. Cincinnati manufacturers are developing prospects but orders are few and far between. Buffalo, on the contrary, has noted an upturn in general business and an increase in inquiries.

PHILADELPHIA has had a few orders for single tools and a few inquiries. Milwaukee also anticipates, but has only government airport orders. New England reports the increasing automotive interest and some worthwhile prospects as business there continues to improve. General Motors, Ford and a truck company have been in the market there recently. Detroit, basing hopes largely on sentiment, expects full-blast machine sales by September 1. Optimism there is based on the increasingly evident intention of manufacturers to apply every possible improvement to new models. A few plants are already reporting an increase in business.

NEW YORK

Municipal and Navy prospects relieve an otherwise dull market. The Navy has not yet closed on the 17 engine lathes for Brooklyn, nor has the Board of Transportation done anything definite on the subway list, but about them centers much optimism. Other lists include a lathe and shaper for the Department of Parks, upon which bids were opened July 21, and about 15 machine tools in a general list from the College of the City of New York. Bids will be opened July 30.

CLEVELAND

Machine tool sales have dropped to the lowest level of the year. Although the industry is "in the dumps," it is the consensus of opinion that by September a graduál upward swing will be underway. Among larger lists expected for fall installation is the new $1,000,000 plant of the Cleveland Lamp Works of the General Electric Co., the new factories of the Addressograph-Multigraph Corporation and the Exide Battery Co. of Philadelphia. City officials of Shaker Heights will soon purchase tools for its new workshop.

CHICAGO

Apathy continues. Inquiries are few in number and indefinite. Despite depressed conditions, however, there is an undertone of optimism among the trade, September being now generally looked forward to as the beginning of a period of greater activity. The Chicago Board of Education has again postponed closing tech school lists.

CINCINNATI

Wearily, the machine tool caravan continues to wend its way over the desert of business depression, with no oasis of orders in sight. The volume of sales was small with the manufacturers, but a measure of success was had by some in developing tentative prospects. Selling agents report no change in the situation and expect no improvement until after the holiday season. Such orders as were received were well scattered and well diversified.

BUFFALO

Optimism expressed a fortnight ago about signs of recovery in purchaser interest seem to have been justified in a small way. Inquiries indicate that more large users are in the market and that some of them will place orders within the next few months. Orders continue small, usually for single pieces of equipment. But there will be real disappointment if a very real improvement does not appear in the fall months. General business conditions seem to be improving.

In the contractors' equipment field conditions continue highly unsatisfactory. Small tool demand is slow.

PHILADELPHIA

A few orders for single tools featured the situation last week. There has been a lack of encouraging signs for an early resumption of orders, and so far as any sizable business is concerned those signs still prevail. There were, however, a few inquiries, and these contain some indication of closing. Cheerful news came from New England, where, this market has heard, business has shown an upturn.

MILWAUKEE

Although activity is showing the usual seasonal slowness, the trend is considered to indicate that anticipated fall business improvement will materialize. Current orders and inquiries are only fair, but this is not considered alarming. One of the most hopeful signs is the automotive field. Electrical manufacturing concerns are also expected to place orders soon. One local firm has made deliveries of a number of medium-sized tools for government airports. Local optimism has been strengthened by visit of hundreds of industrialists and manufacturers to the Kearney & Trecker exhibits July 15-17.

NEW ENGLAND

A dearth of important machine tool transactions tends to belittle the true condition of the industry. Business is dull, and inquiries are by no means plentiful; but those noted in recent weeks indicate improved prospects and new sources. A growing interest from automobile centers is gratifying. Just how far reaching it will be is problematical. So far, General Motors and Ford have been in the market to some extent, also a truck company.

Dealers in used machinery are not deeply concerned about the unusual summer dullness. Some report a nominal business in bench equipment. General Electric, Lynn, has a large order for electric meters and recalled 200 men. Prospective orders on which figures have been submitted include 50 or 60 lathes, grinders and a radial drill.

DETROIT

If sentiment means anything, machinery and machine tool shops in the Detroit area will be running full blast by Sept. 1. Continued betterment of automotive prospects and the increasingly apparent decision of motorcar makers to apply every possible improvement to new models are the bases of marked cheerfulness on the part of the trade in the automobile center. A few plants have already experienced an increase in business and more report good prospective orders.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

"Forgive us our debts, as we forgive our debtors," is a petition with which all Christendom is familiar, and by which not a few of those who call themselves Christians are governed. Therefore, it is not unnatural that the conferences held in London and Paris last week should have been interpreted as indicating a disposition to relax the demands made on Germany, and to try to help rather than to hinder her. It will be more than a half century before the reparation payments that Germany agreed to can be completed under the Young Plan and many things can happen in fifty years. No one affects to believe there has been anything like a final settlement, but deliberations which go to the root of the trouble have been deferred for a clearer view of the subject.

As a result of last week's conversations between the diplomats, a moratorium that will relieve Germany of further payments before Aug. 1, 1932, has been agreed upon. The interval is kaleidoscopic in its possibilities, and it would be a waste of time to talk about them.

Fifty years from now money may be an obsolete medium of exchange, and one writer who is an enthusiast upon the use of credit has prophesied that all men will soon be endowed at birth with certain inalienable rights, which include credit, as well as life, liberty and the pursuit of happiness. Of course, this prophecy is highly visionary, but before the World War commenced, there were many who prophesied that the cost of such a struggle could never be paid. Those who now argue otherwise are just as much entitled to consideration as were their predecessors of 1914.

A Distinct Improvement

The fact is that none of us knows anything of the future, and that as we realize our ignorance we become a little more indulgent of others. Basing our views upon this broad generalization it seems safe to assume that the international intercourse of the future will be less acrimonious than formerly, and that M. Briand may not be so very far wrong in talking about a United States of Europe. Of course, it will take years or decades to familiarize humanity with this thought, but the developments of last week have cheered those who seek peace and pursue it. For this reason the optimists and some who are less optimistic agree that the week has seen a distinct improvement in the benignity of international feeling. Therefore, the possibility of a war seems more remote than at any time since the Armistice. This optimistic view is not generally accepted as yet, but a subconscious recognition of its approach is indicated in the speculative markets, which have ruled higher than in the preceding week.

Business on the New York Stock Exchange has been dull, but prices are more susceptible to good than to bad news, and the same thing may be said of the commodity markets. In copper there has been a slight advance from the bottom, and the demand is said to be good, although some efforts to becloud the facts seem to have been made. In the iron and steel business a similar paradox seems to exist. The manufacturers report no tangible present improvement, but are almost uniformly optimistic in their expectation of fall business.

Commodities Up

Sugar is up nearly half a cent from the lowest, and sentiment is becoming more bullish. The same thing is true of coffee, as the policy of destroying the low grade surplus continues to be followed. Considerable purchases of silver by Germany are reported, and more will be required if her coinage plans are carried out. The dry goods trade in the United States is really better than many merchants seem willing to admit, but most of the mills are running on full daytime schedules, and it seems inevitable that any change in the textile situation must be for the better.

Money is still phenomenally cheap, and with abundant credit at low prices, plus the good crops that now seem to be in prospect, all the essentials of a business revival would appear to be in sight. Therefore, it seems wise to count upon the early arrival of a distinct improvement in business. It was almost in sight when the international bankers took alarm at the European situation some six or eight weeks ago. The emergency has been met and wisely met. It will not involve the creation of new credit and seems to presuppose the liquidation of outstanding obligations sooner than had been expected.

At the end of the Franco-Prussian War, Germany exacted an indemnity of one billion dollars from France. The amount was then thought to be so impossibly large that France said she could not pay it, and talked about repudiating the claim although she had admitted it. But upon second thought she decided to pay, and found that it was so easy to raise the money that Bismarck is reported to have said: "The next time we defeat France we shall insist on paying the indemnity ourselves so that we may enjoy the prosperity that seems to have come to France by her action." Perhaps this is a case in which history will repeat itself, so to speak.

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THE BUSINESS WEEK

July 29, 1931

Despite deepened disappointment regarding the default of decisive measures to meet the European crisis, and increased anxiety about its outcome, there are signs of slow, slight, but significant strengthening in the domestic business situation . . . The stock market and business opinion are apparently responding to these symptoms of domestic convalescence rather than to the depressing influence of foreign factors . . . The London Conference's failure to offer more than a moral appeal to private creditors to recognize the de facto moratorium on Germany's foreign debts, the run on Britain's bank reserves forced by French financial politics, and the consequent constriction of European credit, overshadow encouraging indications of improvement in the outlook at home, but involve no necessary catastrophic consequences for this country . . . Industries closest to the consumer, and usually earliest to recover, are responding strongly to replacement demand at prevailing low prices, and the rapid rise in electric power production since early June reflects diversified increase in productive activity . . . Commodity price levels have shown stability for six weeks. Second quarter earnings reports reflect increasingly successful readjustment of corporate operations to new conditions . . . The construction, equipment and correlated industries still lag for lack of stimulus of easy investment markets and business initiative; but persistent, large-scale pressure toward lower long-term domestic money costs, through aggressive Federal Reserve open market policies, could correct this situation and speed recovery.

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Material Trends and Prices . . . .

Trading in the non-ferrous metals continues quiet, with the exception of fair demand for zinc in carlots. Steel mill operations continue to sag, the general rate now being around 30 per cent of capacity. There are hopes, however, that by fall the rate will have reached 50 per cent, at least. Tank plates and structurals make up the bulk of current orders. A stronger price situation for the near future is indicated in the growing firmness of scrap.

(All prices as of July 24, 1931)

IRON AND STEEL

Pig Iron—	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$12.00	$12.00	$12.70
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	16.20
Heavy Melting Steel Scrap—			
Pittsburgh consuming point, No. 1, per gross ton	10.00	9.75	14.75
Furnace Coke—Connellsville, per net ton	2.40	2.40	2.50
Foundry Coke—Connellsville, per net ton	3.25	3.50	3.50
Steel Shapes—Pittsburgh, base, per 100 lb	1.60	1.65	1.65

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Iron Machinery Castings—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago . . . . . 4.62½ Cleveland . . . . . 4.75 New York 4.75
Cincinnati . . . . . 4.40 Detroit 4.00

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Steel Sheets—Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

* Light plates.

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Seamless Steel Tubing—Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall	Outside Dia. in Inches						
	½	⅝	¾	⅞	1	1⅛	1¼
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc.—Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.20	2.95
Bars, soft steel	3.10	2.95	2.75
Cold fin., flat or square	3.90	3.90	3.60
Cold fin., round or hexagon	3.40	3.40	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	4.00	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.90	3.00

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Stainless Steel—Hot-rolled bars, base, Pitts., cents per lb:

Chromium, 15%, carbon 0.12% and under	19.00
Chromium, 15 to 18%, carbon 0.12% and under	20.50
Chromium, 18 to 23%, carbon 0.12% and under	23.00
Chromium, 23 to 30%, carbon 0.12% and under	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots . . . . . 73@10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots, 99%, N. Y.	23.30
Copper, electrolytic, Conn	8.00
Copper wire, base, Chicago and Cleveland	10.12½
Copper wire, base, N. Y.	10.00
Lead, pigs, E. St. Louis	4.22½
Tin, Straits, pigs, spot, N. Y.	25.00
Zinc, slabs, E. St. Louis	3.90
Prices following are in cents per lb., base, N. Y., Chi. and Cleve:	
Brass rods, high	13.75
Brass sheets, high	15.50
Brass tubing, high	20.37½
Copper, drawn round	16.37½
Copper sheets	17.87½
Copper tubing	20.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.50
Babbitt, genuine, highest grade	45.00
Solder, bar	19.37½
Prices following are in cents per lb., base, Huntington, W. Va:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals—Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	3.00	4.25	4.00@4.25
Light brass	2.12½	3.25	3.25@3.75
No. 1 rod-brass turnings	3.50	4.50	4.00@4.50
Heavy copper	5.50	7.00	6.25@6.75
Light copper	4.50	6.00	5.50@6.00

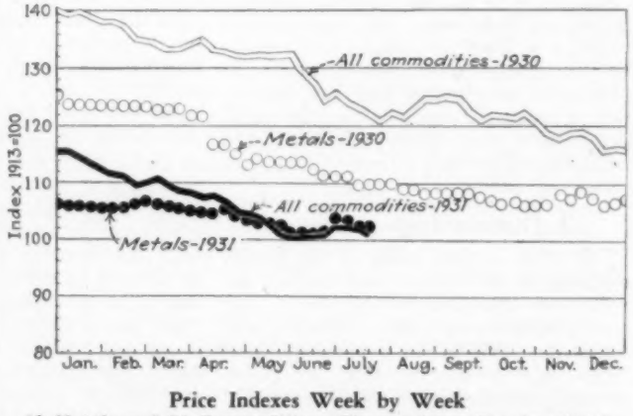
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide mineral, cloth, 6-in. dia., No. 1, less than 200, per 100	$4.36	$4.59	$4.59
Belting, leather, heavy, discount	30@10%	30–5%	40%
Belting, rubber, trans., 1st grade, discount	60–10–10%	50–10%	60%

Lumber—Per M ft., b.m., 16 ft. lengths, del., N. Y:

Crating—Southern pine:
1x4-in . . . . . $27.00 1x6-in $26.00

Skids—Spruce:
2x4-in . . $45.00 3x3-in . . $46 00 4x6-in . . $48.00 6x6-in . . $52.50



Price Indexes Week by Week

(6 Metals and 74 Commodities—Figures from The Annalist.)

NEWS

Iron & Steel Founders to Meet in Fall

The first fall meeting of the Steel Founders' Society of America, Inc., 932 Graybar Building, New York, N. Y., will be held in Chicago on Thursday, September 17. Other meetings scheduled include one to be held in New York on October 22, the day preceding the fall convention of the American Iron & Steel Institute.

The fourth annual convention of the Gray Iron Institute will be held at the West Baden Springs Hotel, West Baden Springs, Indiana, Thursday and Friday, October 15 and 16. In addition to the reports of committees, report of officers and the election of directors and officers, complete discussions on the technical, merchandising and cost phases of the industry are scheduled.

Simplified Practice

Twenty new simplified practice recommendations were developed by general conferences during the fiscal year ending June 30, 1931, according to EDWIN W. ELY, Chief of the division of simplified practice of the National Bureau of Standards, in a report for that period to DR. G. K. BURGESS, Director of the Bureau. These additions raised the total number of general conferences to 149.

General Motors Reports

The General Motors Corporation had a second quarter net income up 3.3 per cent from a year ago, though sales to the public were off 2.5 per cent, compared with a 27 per cent drop for the entire industry. The net income for the second quarter averaged $1.22 a share, as compared with $1.17 the same quarter of last year.

G. E. Reports

Orders received by the General Electric Co. for the first six months of 1931 amounted to $141,428,978, compared with $190,313,758 for the corresponding period last year, GERARD SWOPE, president, announced July 21. Sales billed for the six months of 1931 amounted to $141,180,091.13, compared with $197,229,346.82 for the corresponding period last year. Profit available for dividends on common stock for the first six months of 1931 was $21,523,722.88, compared with $29,273,276.14 for the first six months last year. The profit available for common stock for the six months is equivalent to $0.75 per share in 1931 and $1.01 per share in 1930 on the 28,845,927 shares outstanding in both periods. The quarterly dividend is 40 cents a share.

Steel Founders' Report Shows Further Decline

Comparing June figures with those for May, an increase of 16.5 per cent in the number of steel founders reporting operations below 50 per cent is indicated by the latest report of the Steel Founders' Society of America, Inc. No foundries operated up to capacity in June. Bookings for June below 50 per cent of capacity were reported by 16.7 more foundries with corresponding decreases in the upper brackets. A 21.2 per cent increase occurred in the number of foundries reporting current operations below 50 per cent. 6.9 per cent of the foundries reporting indicate increases in numbers of inquiries received as against 11.5 per cent for last month. The general picture shows a still further seasonal recession of business with the raw materials' market showing some signs of recovery and the business outlook indicating the usual summer slacking off of new business and production.

Steel Fabricators' Trade Rules Issued

The Federal Trade Commission has made public the trade practice conference rules of the structural steel fabricators' industry which have been accepted by the industry following a number of changes of wording suggested by the Commission. The Commission also declined to approve or accept one Group I and four Group II rules formerly adopted.

Ten Group I rules pertain to the following subjects: Substitution of materials inferior to those specified by purchasers; using manufacturing methods not in accord with governmental rules; selling goods below cost with the intent of injuring a competitor; secret payment of rebates; defamation of competitors; inducing breach of contract; discrimination in price; false advertisement of quality and grade of products; aiding and abetting another in use of unfair trade practices; and deviation from established standards of the industry.

Group II rules accepted by the Commission as expressions of the trade, relate to minimum standards of structural designs; standard form of contract; committee of trade practices; and definitions of the following: the industry, a distributor, a mill, a warehouse, a fabricator, and an erector.

Marketing Conference Program Tentatively Set

Announcement has been made that the Industrial Marketing Conference of the American Management Association has been definitely set for October 21, 22 and 23, at the Hotel Statler, Cleveland, instead of October 14-16. The division will sponsor two programs, which have been tentatively arranged. One program will consist of four sessions, morning and afternoon, devoted to subjects covering industrial product research, industrial market research, and industrial marketing research. The other program will consist of two sessions, morning and afternoon, given over to export industrial marketing, the program for these sessions being arranged for and conducted by the Northern Ohio Export Management Conference. The scope of the papers and discussions has been worked out but the speakers have not yet been assigned.

Federal Specifications

New Federal Specifications include QQ-F-191 for ferrotitanium, succeeding USGMS 144, and QQ-C-501, superseding USGMS 467 on copper bars, plates, rods, shapes, sheets and strips.

80-mesh screen gauze, woven of No. 36 Monel metal wire, welded with atomic hydrogen by clamping the pieces between two pieces of steel and making a weld of the edge type

Foundry Equipment Orders Show Falling Off

The June report of the Foundry Equipment Manufacturers' Association shows a net orders figure of 40.9, as compared with a three-months' average of orders of 50.9. Shipments are 90.4 and unfilled orders 70.1. The base for these figures is average monthly shipments for 1922-24 taken as 100.

Civil Service

The United States Civil Service Commission has announced open competitive examinations for associate engineer and assistant engineer, optional in the branches of aerial navigation, aeronautical, construction, heating and ventilating, and telephone and telegraph engineering. Application must be on file not later than Aug. 21.

Engineer Conference Program Announced

A detailed outline has been announced of the program of morning lectures and seminars and evening round table discussions to be held during the economic conference for engineers under the joint auspices of the alumni of Stevens Institute of Technology and of Columbia Engineering School at the Stevens Engineering Camp from Aug. 29 to Sept. 7. Men who will lead the round table meetings are now being selected. The statistical analysis of events and conditions with which the series will open is under the direction of S. L. ANDREW, chief statistician of the American Telephone & Telegraph Co., and W. H. RASTALL, chief of the Industrial Machinery Division of the U. S. Department of Commerce, will talk about constructive planning, dealing specifically with the need for an equipment policy. A number of other leading economists and business men, including WILLIAM T. FOSTER and DEAN DONHAM of the Graduate School of Business Administration at Harvard, have been invited to speak at the conference and will probably accept.

Morning programs include Principles and Practices of Corporation Finance, with various sub-topics, such as: Forms of business organization; instruments of finance; financial operating policy; earnings and dividend policies; marketing of securities, and reorganization procedure. The other morning topic is The Engineering Approach to Corporation Finance, with such topics as: The growth of money from a fixed deposit or from periodical payments; capital returns on bonds and stocks; depreciation as a factor in cost; depreciation as a factor in value; analysis of statements and offerings of securities, and the working out of a reorganization program.

Evenings will be devoted to a study of depression with a wide number of subjects and aspects being discussed, including over-production; emergency measures; stabilization; unemployment insurance; constructive planning.

According to the plan for the camp, mornings and evenings will be devoted to study, while the entire afternoon of each day will be free for recreation.

Gray Iron Production Shows June Decline

As was expected, June gray iron production declined under figures for May of this year, the percentage of decline, interestingly, being the same as that for the same period last year, according to the Gray Iron Institute. New business, unfilled orders, and material received also showed expected declines. Production for June was 53 per cent of normal, as compared with 60.7 per cent in May and 73.7 for June of last year. New business was 40.1 per cent for June, as compared with 51.2 for May and 58.4 for June, 1930. Unfilled orders were 28.8 per cent of normal, as compared with 39 per cent the previous month and 40.5 per cent for June, 1930. The business outlook, however, remains practically the same as for the previous month, which is taken to indicate a late summer or early fall upturn. Greatest activity occurred in Wisconsin, Illinois, and the area west of the Mississippi and south to the border. Plants with a volume of 1 to 100 tons per month showed greatest activity.

Chain Belt Conducts Prize Contest

The Chain Belt Co., Milwaukee, Wis., will conduct a prize contest from Aug. 1 to Sept. 21 for the "missing links in practically any business." This company is offering $500 in prizes for the best descriptive article and rough sketch showing how the company's conveyors or other products can be applied to lower costs. Articles are to be judged solely on merit, and no plant size limitations have been set. First prize $200, second $100, third $50, next fifteen $10.

Allis-Chalmers Announces Plant Purchases

Formal announcement is made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., of the acquisition of the principal assets of the American Brown Boveri Co., Inc., and the capital stock of Condit Electrical Mfg. Corporation, Boston, Mass. (*AM*—May 28, June 18). By this purchase Allis-Chalmers secures several new lines of equipment, including electric railway apparatus, mercury arc rectifiers, blowers, electric furnaces and oil circuit breakers.

After completing the manufacture of goods on order at Camden, N. J., operations now carried on by the American Brown Boveri Co., Inc., will be segregated. The large apparatus departments and work, with substantially the same personnel, will be transferred to Allis-Chalmers' plants at Milwaukee and Pittsburgh, while the remainder will be moved to the Condit plant at Boston, Mass. The Allis-Chalmers' district and branch sales offices will, in the future, serve as the main outlet for the former American Brown Boveri products.

Ownership of the Condit corporation will secure for the Allis-Chalmers Mfg. Co. a New England manufacturing plant and increased service, distribution and marketing facilities in that section.

Industrial Production Shows Decline in June

Industrial production showed more than the usual seasonal decline in June, and factory employment and pay rolls decreased, according to the Federal Reserve Board. Wholesale prices, which had continued to decline until the end of May, advanced in June, but for most commodities declined again in the first half of July. A decrease in industrial output from May to June was reflected in a decline in the Board's index of industrial production, which is adjusted for seasonal variations, to 86 per cent of the 1923-1925 ouput, as compared with 89 per cent in May. Taking the second quarter of the year as a whole, production has averaged about 4 per cent above its low level in the last three months of 1930.

Plan Nation-Wide Survey of Blue Print Industry

Preliminary arrangements for a nation-wide survey of production and distribution costs and methods in the blue print industry have been completed as a result of a conference between the Survey Committee of the International Association of Blue Print and Allied Industries and officials of the Merchandising Research Division of the Department of Commerce, which will conduct the study. The request that the Commerce Department undertake the analysis of the blue print industry on a national scale was made largely as a result of the practical value of the preliminary survey of the trade which was made by the department two years ago.

The contemplated survey will aim at the inclusion of important concerns engaged in the blue print and allied trades in every section of the country. The survey will be conducted by the personal interview method, and a large share of the expenses other than the expert services supplied by the Commerce Department will be borne by the International Association of the industry which is sponsoring the work.

The blue print survey will aim at a detailed analysis of production and distribution costs by departments, following the product through all stages from the raw material to its passage into the hands of the consumer. Special attention will be paid to providing a statistical picture of costs and profits in connection with orders of varying sizes, and for different classes of commodities.

New Soviet Patent Law Offers Meager Protection

BY OUR BERLIN CORRESPONDENT

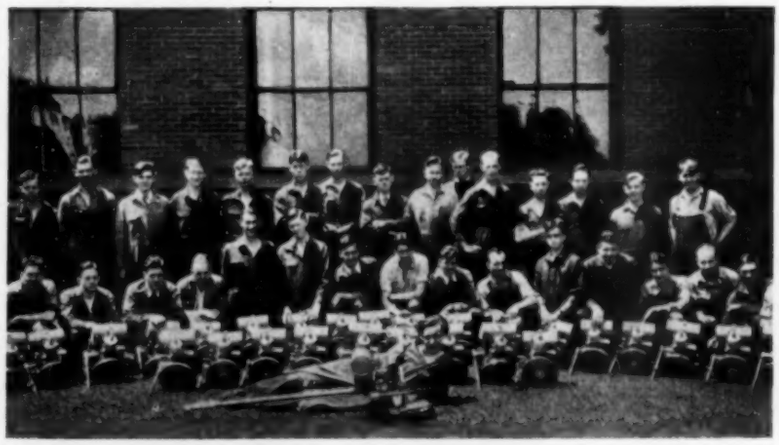
On April 9 the government of the USSR confirmed a new patent law. Unfortunately, this new law offers foreign inventors and industrial concerns only meager protection. In disclosing drawings and constructional details to Russia, which are often asked for by Russian organizations under the pretext of requiring them for the manufacture of spares, it is advisable to be very careful, for, particularly in case of legal proceedings ensuing from actual copying of foreign machines or parts, the foreigner is entirely at the mercy of the Russians before their courts.

The former law, of Sept. 24, 1924, was based on the principle of the patentee's monopoly, similar to patent laws in capitalistic countries. When this law was published in 1924, it had long been superseded, since it could not be made to suit the new economic and legal structure of the Soviet state. In time, the "exclusive" rights of the patentees became more and more an illusion, so that little encouragement remained to inventors. On the other hand, the question of putting former inventions into practical use had to be solved, something especially difficult since the various concerns which are not competitors in the usual sense of the word are not particularly anxious to secure any patent rights for themselves. As a consequence, the Russian government was faced with two problems, which were solved poorly because of the economic situation of the country at that time: Comprehensive sponsoring of inventive activity, and industrial utilization of inventions. One has to consider that all the industries of the country are owned by the state, and that the inventor cannot be conceded a monopoly on his invention, according to prevailing opinion, as this would contradict the general laws of the Soviet constitution. The inventor, therefore, is unable to make practical use of his invention, so that the state has to take care of this, or rather, of the technical advance. (This should be noted especially when granting licenses to Russia.) In order to meet the requirements of the constitution, the law provides for the following regulations:

1. Patents, in the usual sense of a government confirmation of the inventor's exclusive right to make use of his invention, are only granted on special request. If someone registers an invention which is acknowledged as being new by the patent office, the inventor obtains a special certificate of origination. The inventor may only employ his invention for himself or in his own firm; all other rights belong to the state. The state's equivalent for obtaining the patent is: payment of a compensation in case the patent is made use of; entire exemption of the inventor from all now existing fees; a number of material advantages for domestic inventors, such as pensions, decorations, medical assistance, leave, advantages in the exceedingly poor Russian housing conditions, or in taxation, etc.

2. Every patent is tested not only as to its novel character, but also by industrial experts as to its utility. All patents found to be of use are to be utilized immediately.

This change of the patent laws throws light on the actual condition in so far as it expressly confirms the fact that the inventor has no rights of monopoly, and that the rights and duty to utilize the invention do not pertain to him, but to the industry, or rather to the Russian state.



Mechanical engineering students at the University of Minnesota get practical production training in addition to the usual machine shop practice. Here is a class and a group of the outboard motors the university shop turns out at a rate as high as 100 per day

However, in consideration of foreign countries or of foreign inventors resident in Russia, these regulations cannot be employed in all cases, and the Soviet state has issued special regulations for such cases (only formally, since they are practically useless). It must not be forgotten that a large number of American and German engineers are employed in Russia by American or German firms to supervise the erection of machine works, power stations, etc. within the scope of the 5-year plan.

In such cases the position is the following:

The registrator of an invention can ask for a certificate of origination (always see that the words "originator" or "certificate of utility" are translated correspondingly), or for a patent. Both kinds of applications are tested in the same way as to utility and novelty, the difference existing in the fact that the applicant for a patent has to pay fees, and that the proprietor of the patent has the *exclusive* right of exploiting the patent. The latter clause has, however, only a nominal value, as under actual conditions in the USSR by far the greater part of all inventions can only be employed in the government industries, viz.: with the consent of the government. *A patent on any "useful" invention may, however, be confiscated against payment of a compensation!*

Compensation if Used

Both the proprietor of a certificate of origination, as well as the proprietor of a patent, obtain a compensation if the invention is made use of. The actual rights of the proprietor of a patent are then exactly the same as those of an inventor who has applied for a certificate of origination, since the former will rarely be able to achieve better conditions in his negotiations with the government, which has the medium of annexation or taking a license by force, than those prescribed by the government. The only real difference between the two classes is that proprietors of patents have to pay fees, which are especially high in Russia.

As an effective protection against this useless regulation, which grants the foreigner none, and the Russian government all rights, one can only advise an inventor not to sacrifice really valuable inventions until successful negotiations have taken place with the respective Soviet agency (the Amtorg in the U. S.), preferably with the object of a one-time payment of a large sum as a compensation for the manufacture in Russia. These negotiations would have to include expressly: *payment in advance*, since once a license has been granted one has no control over the actual manufacture, while on the other hand it is easily possible that the invention is laid up by Soviet officials not interested in it, who may be managing the works at which the invention is to be exploited. Further, such a contract would have to stipulate that Russia may only manufacture for its own use and not for exporting purposes.

BUSINESS ITEMS

Lukenweld, Inc., a division of the Lukens Steel Co., Coatesville, Pa., has appointed W. R. McDonough & Co., representative in the Cleveland district, and the Dravo-Doyle Co., as representative in the Pittsburgh district.

The Empire Tool Co., Dayton, Ohio, will move to Newcastle to occupy part of the plant formerly used by the Chard Lathe Co. Operations are expected to be resumed in August. The company manufactures dies, tools, jigs and special machines.

The Black & Decker Manufacturing Co., Towson, Md., was recently announced as the winner of the safety campaign staged by the Baltimore Safety Council during the past six months. The company, during the period of the campaign, did not have a single lost time accident. Seventy-nine plants in and around Baltimore competed.

The Maxim Silencer Co., Hartford, Conn., has combined with the Campbell Metal Window Corporation, Pershing Square Bldg., New York, N. Y., a subsidiary of the American Radiator & Standard Sanitary Co., for the marketing and manufacturing of the Maxim-Campbell silencer and air filter unit. The Campbell company will fabricate and market the product, which resulted from the work of DR. HIRAM PERCY MAXIM and H. E. CAMPBELL. The Maxim Silencer Co. will continue to manufacture and sell its standard line of industrial and marine silencers.

The Chain Belt Co., Milwaukee, Wis., has appointed two new distributors, the Vermont Road Equipment Co., Montpelier, Vt., and the Northwest Machinery Co., 710 Front St., Boise, Idaho, to represent Chain Belt in their respective states.

The Rockford Bolt Co., has been acquired from the A. M. Wise estate by a group of Rockford, Ill., men, who have reorganized the firm as the Rockford Bolt & Steel Co. F. W. GAFFNEY is president; H. SADEWATER, vice-president; R. J. GAFFEY, secretary, and J. C. O'CONNOR, treasurer. S. J. O'CONNOR, general manager for the past ten years, has been associated with the company for the past 45 years. The firm will manufacture bolts, fabricated steel and all kinds of steel and iron specialties.

The largest gross business and net profits in any semi-annual period in its history excepting the 1930 period were shown by the Viking Pump Co., Cedar Rapids, Iowa, for the first half of the current year, according to a recent report by the company's bankers. Gross profits on sales were $209,000 and total current assets are $765,000, about ten times current liabilities. Net earnings, after depreciation and taxes, were more than three times the preferred stock requirements.

The Vigilante Pump Co., 6225 E. 14th St., Oakland, Calif., has begun the manufacture of centrifugal pumps for deep well purposes. CHARLES E. MOWRY is owner and manager.

Merger of the Fulton Iron Works Co., Wellston, Mo., with the Goslin-Birmingham Manufacturing Co., Birmingham, Ala., has been approved by directors and stockholders of the Fulton company, which makes machinery for cane sugar mills. Combined invested capital will be about $10,000,000, it was announced by H. J. STEINREDER, chairman of the board of Fulton. The Whiting Corporation of Chicago will furnish additional working capital and control the new combination.

Palmer Steel Co., Springfield, Mass., will begin construction of an addition to its plant for fabrication of structural steel in Chicopee about Aug. 15. The addition will be two buildings, one 360 by 60 ft., with the craneway extending lengthwise an additional 440 ft., and the other 82 by 180 ft., with craneway running at right angles 90 by 240 ft. The present plant is 82 by 280 ft.

Clark Metals, Ltd., has been moved from Listowel to Belleville, Ont., where it will occupy a section of the plant of the Stewart-Warner-Alemite Corporation of Canada, Ltd., which has been extended for the purpose. Clark Metals, Ltd., is a subsidiary of the Bassick Manufacturing Co., Bridgeport, Conn., which in turn is a subsidiary of Stewart-Warner.

The Pacific Hoist & Derrick Co., will build a new structure to be known as the Machinery Mart at Fourth Avenue South and Hanford Street, Seattle, Wash. The building, 80x200 ft., with a craneway extending through and 50 ft. beyond the main warehouse, is expected to cost $60,000.

The J. V. McClaskey Co., and the Dalzell Bros. Co., sheet metal firms of Youngstown, Ohio, will be consolidated as the Dalzell Bros. Co., with J. V. MCCLASKEY as vice-president and J. J. DALZELL as president.

Heaters of Canada, Ltd., has announced its intention to build a factory at Oakville, Ont., to manufacture house and factory heaters, radiators for motor cars and motor car parts.

The Herberts Machinery Co., Ltd., Los Angeles, Calif., has been appointed exclusive agent for the Pacific Coast by the Superior Machine & Engineering Co., 1930 Ferry Park, Detroit, Mich.

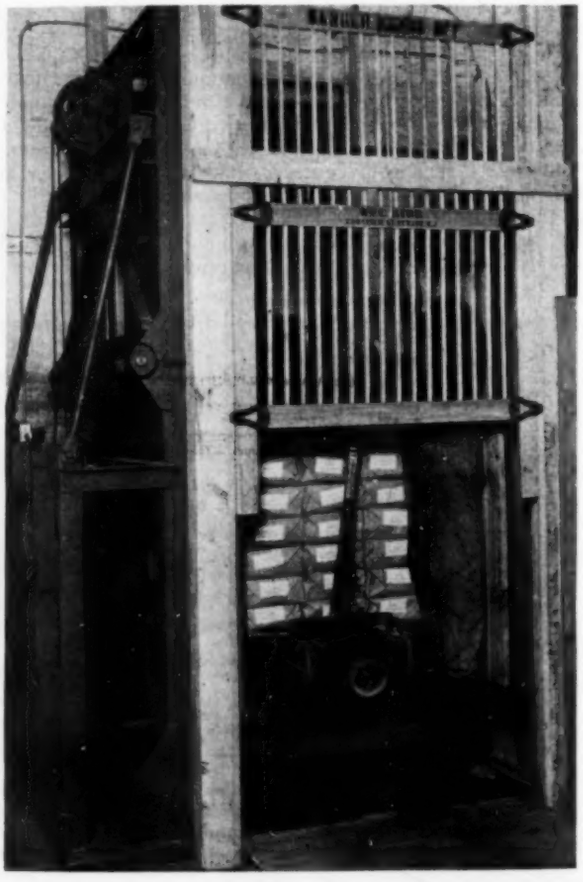
Eight hundred men returned to the Maytag Washing Machine factory, Newton, Iowa, July 20, after the annual vacation period.

The DeSoto-Plymouth plant, Detroit, Mich., will be increased by 30,000 sq.ft., by an L-shaped addition to the present plant building.

The Board of Industrial Counselors, Inc., New York, N. Y., has moved to 21 East 40th St.

The Kinite Corporation, Milwaukee, Wis., has opened a new foundry at Fairmont, W. Va., which will specialize in the manufacture of electric furnace iron castings for glass plants. The new foundry is now making the castings for the Fairmont mold plant of the Owens-Illinois Glass Co., and will supply other plants in that territory. These castings were formerly manufactured at the Toledo foundry of the Kinite Corporation.

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., has completed the acquisition of the American Brown Boveri Co., Inc., and the Condit Electrical Mfg. Corporation, Boston, Mass.



This Barrett portable elevator is permanently installed and equipped with safety gate to replace a ramp between floors at different levels. The platform size is sufficiently large to accommodate standard lift trucks or platforms, and capacity is sufficient to accommodate both load and operator. Control of the driving motor is by push button

PERSONALS

FRANK C. RUSHING

FRANK CROFFORD RUSHING of the Industrial Motor Engineering department, Westinghouse Electric & Mfg. Co., has received the Lamme Memorial Scholarship Award which will enable him to spend the school year of 1931-1932 continuing his engineering studies at the Universities of Charlottenberg and Berlin, Germany. This is the third award, previous ones going to L. R. Ludwig and Morris Stone.

E. J. MEHREN, Chicago vice-president of the McGraw-Hill Publishing Co., who, during his 22 years with the organization, played a most important part in the development of its many properties and of the institution itself, has resigned to become president of the Portland Cement Association.

PHILIP B. BLOEDEL, formerly general manager of the Buffalo Tool & Stamping Co., and president of the Mignon Electric Corporation, has been named president and general manager of the Bloedel Mfg. Co., recently organized to establish and operate a plant for the manufacture of dies, tools and stampings in Buffalo, N. Y.

THOMAS B. CHRISTIE, formerly associated with Sawyer-Massey, Ltd., Hamilton, Ont., has been appointed sales manager of the Hamilton Gear & Machine Co., Ltd., Toronto.

FREDERICK B. COOLEY, president of the New York Car Wheel Co., Buffalo, N. Y., has been elected a member of the executive committee of the Buffalo chamber of commerce.

GEO. C. DIERKING, production manager of the Steel Tank & Pipe Co., Portland, Ore., has been elected chairman of the Portland section, American Welding Society. F. V. ROMIG, chief engineer of the Beall Pipe & Tank Co., has been elected vice-chairman. WM. P. KELLOGG, district manager of the Air Reduction Sales Co., has been elected treasurer. G. B. HERINGTON, consulting engineer, is secretary.

E. W. EWERTZ has been awarded the Samuel Wiley Miller Memorial Medal by the American Welding Society for his pioneering in the development and application of arc welding.

ARTHUR W. CLARK, vice-president in charge of sales, Wayne Home Equipment Co., New York, and formerly president of the Boston Oil Burner association, has been appointed managing secretary of the newly-created dealer division of the American Oil Burner association.

PROF. S. W. DUDLEY, Strathcona professor of mechanical engineering and chairman of the mechanical engineering department, Yale University, has rejoined the engineering organization of the Westinghouse Air Brake Co., Wilmerding, Pa., in an advisory capacity. He will be assistant to the vice-president and will retain his university connections. He was formerly with Westinghouse from 1905 to 1921, for the last seven years as chief engineer.

C. N. JOHNS has been appointed general manager of the Page Steel & Wire Co., Bridgeport, Conn., with headquarters at Monessen, Pa. W. H. BLEEKER, JR., has been made sales manager with headquarters at 701 American Bank Bldg., Pittsburgh.

ARNOLD LENZ, general manager of the Chevrolet Gray Iron Foundry division, General Motors Corporation, Saginaw, Mich., was recently appointed a member of the citizen's advisory committee on employment stabilization by Gov. Wilbur M. Brucker, of Michigan.

TOM E. LORD has been appointed machine tool representative for the State of Michigan by the National Tool Co., Cleveland, Ohio. He will handle the National-Cleveland line of machine tools from his office in the First National Bank Bldg., Detroit, Mich.

R. D. LIVINGSTON, formerly vice-president of the Signode System, Inc., and its successor, the Signode Steel Strapping Co., has been appointed general manager of the Consolidated Steel & Wire Co., 18 Tremont St., Boston, Mass.

C. J. MCLEAN has been elected a member of the board of directors of the Holland (Mich.) Furnace Co., to succeed the late C. M. MCLEAN.

J. C. NICHOLLS of Copper Cliff has been promoted from general manager to assistant to the president at Toronto of the International Nickel Co. of Canada, Ltd. DONALD MACASKILL has been promoted from manager of the mining and smelting division to general manager. DR. JOHN F. THOMPSON, assistant to the president, was appointed vice-president. Both Dr. Thompson and Mr. MacAskill have been with the company or the predecessor companies for a quarter of a century, while Mr. Nicholls joined the company in 1913.

CHARLES M. SCHWAB, for many years the largest stockholder in the Stutz Motor Co. of America and one of its directors, and who sold his interest and resigned from the board, has become again the largest stockholder, according to a recent announcement. He and his associates have approximately 70 per cent of the common stock.

ALEXANDER TAYLOR, assistant to the vice-president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been assigned to duties in connection with the company's locomotive contract from the Pennsylvania railroad. His previous work has been assigned to H. C. THOMAS, director of manufacturing stock. E. R. NORRIS has been appointed assistant to J. M. HIPPLE, general works manager. C. G. BRUNNELL, formerly purchasing agent at East Pittsburgh, is now general purchasing agent, reporting to the general works manager.

E. O. WILLIAMS, formerly manager of the Howe Chain Co., Muskegon, Mich., and associated with the transmission and industrial chain industry in various capacities for the past 16 years, has been placed in charge of the Philadelphia office in the Bourse Bldg., of the Union Chain & Manufacturing Co., Sandusky, Ohio.

OBITUARIES

CHARLES S. BARRY, 56, secretary-treasurer of the Murray Co., Dallas, Texas, manufacturer of cotton ginning machinery, died recently.

PETER M. BOECK, formerly superintendent of the Challenge Machinery Co., Grand Haven, Mich., died recently.

JOSEPH EASTWOOD, 69, president and manager of the American Forge Co., San Francisco, died recently at Mountain View, Calif.

LYLE C. FRENCH, 37, chief inspector, Caterpillar Tractor Co., Peoria, Ill., died June 13 in a Peoria hospital.

J. J. GRIFFITH, of the railroad electrification department at Wilkes Barre, Pa., of the Westinghouse Electric & Manufacturing Co., died July 10.

R. CAREY MAY, 69, director of the Defiance (Ohio) Machine Works, and many years ago its European representative, died recently.

DANIEL B. MOORE, 53, who retired last year as plant superintendent of Kewanee (Ill.) Boiler Corporation, died recently. He had been with the company 38 years.

ROBERT W. PRYOR, formerly identified with the Buffalo Forge Co., and lately partner in Joithan & Pryor, New York, sales engineers, died at Newark, N. J., July 10.

GEORGE S. SCOVEL, 70, chairman of the board of directors of Waterhouse-Weinstock-Scovel Co., San Francisco, died there July 11.

BERTHA L. WHITE, treasurer of the Atlas Drop Forge Co., Lansing, Mich., died July 10 at Battle Creek, Mich. She joined the Atlas company upon its organization in November, 1906, and had been treasurer since Sept. 8, 1917.

WALTER HUNTER WHITESIDE, formerly Pacific Coast representative of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died July 18 in Pasadena, Calif.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Colo., Salida—Travertine Co., c/o Justin H. Haynes, Salida, and John A. Taft, 162 North Franklin St., Chicago, Ill., plans to construct a travertine mill, here. Estimated cost $1,000,000.

Ill., Chicago—Chicago Worlds Fair 1933 awarded the contract for an electrical group of buildings on Northerly Island, south of 16th St. Estimated cost $900,000.

Ill., Chicago—Sears, Roebuck & Co., Arthington and Homan Sts., plans the construction of a 1 story automobile service garage, etc., in connection with parking station. Estimated cost $60,000.

Ind., Indianapolis—State Highway Dept. awarded contract for the construction of a garage and service building at 520 West Market St. Estimated cost $150,000. Noted July 9.

Mass., Belchertown—Commonwealth of Massachusetts, Dept. of Mental Diseases, will receive bids until Aug. 11, for the construction of an industrial school, etc. Estimated cost to exceed $150,000. Kendall Taylor & Co., 209 Columbus Ave., Boston, Archts. R. B. Kimball Co., 6 Beacon St., Boston, Engr. Noted July 9.

Mass., Cambridge—Harvard Sq. Garage, Newton, awarded contract for alterations and addition to garage on Boylston and Mt. Auburn Sts. Estimated cost $50,000.

Mass., Greenfield—Greenfield Buick Co., J. S. Faulkner, Niles St., is having plans prepared for a 1 story addition to garage and sales building. Estimated cost $50,000. F. A. MacSheffray, 857 Commonwealth Ave., Boston, Archt.

Mass., Mattapan — M. Ingraham, 891 Purchase St., New Bedford, awarded contract for a 1 story garage, etc., at 680 Morton St., here. Estimated cost $40,000.

Mass., Salem—Estate of Mary M. Creedon, 428 Essex St., will build a 1 story addition to garage at 430 Essex St. Work will be done by day labor. Estimated cost $40,000. Andrews, Jones, Biscoe & Whitmore, 50 Congress St., Boston, Archts. Noted July 9.

Mass., Somerville (br. Boston)—City, J. J. Murphy, Mayor, City Hall, plans the construction of a municipal garage. Estimated cost $100,000. Architect not selected. Maturity about October or November. Noted July 9.

Mass., Worcester — Sewer Dept., City Hall, will soon receive bids for the construction of a 2 story workshop and storehouse at Worcester St. yard. Estimated cost $160,000. R. C. Gorrani, 175 Green St., Archt.

Mich., Detroit—Chrysler Corp., 341 Massachusetts Ave., Highland Park, is having plans prepared for the construction of a 1 story, 192 x 240 ft. auto factory on Mt. Elliott Ave. and Lynch Rd. Estimated cost $140,000. Albert Kahn, Inc., 1000 Marquette Bldg., Detroit, Archt.

Mich., Mt. Clemens—U. S. Government, Selfridge Field, awarded contract for the construction of machine shop, assembly shop, etc., at Selfridge Field. Estimated cost $250,000.

Mo., Jefferson City—State Hy. Dept. will receive bids in three or four weeks for the construction of thirty maintenance buildings, 1 story, 41 x 76 ft., at various points in state. Estimated cost about $5,000 each. T. H. Cutler, Ch. Engr.

Mo., St. Louis—Weinburg Construction Co., Wainwright Bldg., 7th and Chestnut Sts., purchased site at 712-18 Morgan St., and will construct 5 story, 80 x 100 ft. garage. Estimated cost $150,000. Work will be done by company forces.

Nev., Reno—Parker Brick Co., recently organized, E. E. Roberts, Vice Pres., plans the construction of a plant for the manufacture of brick, tile and clay. Estimated cost $40,000.

N. J., Allwood—Ballinger Co., 12th and Chestnut Sts., Philadelphia, Pa., Archt., will receive bids about August 15 for alterations to plant here, for American Colortype Co., 207 West 25th St., New York, N. Y. Estimated cost $40,000. Noted July 23.

N. J., Englewood—Bd. of Education, 11 Eagle St., plans the construction of a 2 story vocational school. Estimated cost $150,000. Architect not selected.

N. J., Montclair—White Motor Sales Corp., 640 Bloomfield Ave., will not construct service garage at Grove St. and Glenridge Ave. $40,000. Lewis & Leonard, 51 East 42nd St., New York, Archts. Noted November, 1930.

N. J., Newark—American Realty Co., c/o New Jersey Title & Realty Co., 24 Commerce St., lessee, awarded contract for addition and alterations to factory on Clifton St. Estimated cost $40,000. Noted July 9.

N. J., Newark—Bd. of Commissioners, City Hall, awarded contract for the construction of a 1 story, 100 x 140 ft. manufacturing plant at Port Newark. Estimated cost $40,000. Building will be leased to Reliable Box & Lumber Co., 65 Ave. A. Noted June 18.

N. J., Newark—Jacob Gennet, 251 Hillside Ave., postponed construction of 1 story automobile laundry shop at 257 Elizabeth Ave. $40,000. Architect not announced. Acme Auto Laundry, 259 Elizabeth Ave., lessee. Maturity probably in September.

N. J., Newark—New Jersey Bell Telephone Co., 540 Broad St., will not construct 6 story garage and warehouse at Loretta Ave. and Fabyan Pl. $750,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, Archts. Project in abeyance. Noted April 9.

N. J., Ocean Township—S. Schultz, Colonial Terrace, will not construct 1 story automobile repair shop and garage. $40,000. Architect not selected. Project abandoned.

N. J., Paterson—John S. Royal, c/o Lee & Hewitt, 152 Market St., Archts., will receive bids in April 1932, for a 2 story, 65 x 165 ft. factory. Estimated cost $40,000. Noted May 7.

N. Y., Maspeth—I. Fader, 826 Flushing Ave., Brooklyn, is receiving bids for the construction of a service garage at 54th St. and Flushing Ave. here. Estimated cost $40,000. T. Goldstone, 26 Court St., Brooklyn, Archt.

N. Y., New York—Angelina Monteleone, 2952 Park Ave., is having preliminary plant prepared for the construction of a 1 story service garage. M. W. DelGuadio, 545 5th Ave., Archt.

N. Y., New York—Max Levinstein, 665 Hunts Point Ave., plans the construction of a 1 story storage garage and factory building. Estimated cost with equipment $40,000. S. F. Oppenheimer, 55 West 42nd St., Archt.

N. Y., New York—J. F. McGowan, 1180 Randall Ave., is having preliminary plans prepared for the construction of 150 x 200 ft. service garage. Estimated cost $40,000. Private plans.

N. Y., New York—National Screen Service Inc., 126 West 46th St., will receive bids late August for the construction of a 7 story, 98 x 100 ft. factory and office at 346 West 40th St. Estimated cost $250,000. Berlinger & Kaufman, 232 Madison Ave., Archts. Noted July 9.

N. Y., New York—Rockwells Bakery, 328 East 75th St., has awarded the contract for converting factory into service garage at 439 East 75th St. Estimated cost $40,000. Noted June 25.

N. Y., New York—W. Tatt, 348 West 27th St., will receive bids in fall or later for the construction of a 4 story service garage. Estimated cost $100,000. W. Shary, 22 East 17th St., Archt. Noted June 25.

N. Y., West Brighton—Tompkins Bus Corp., M. Gordon, 735 Richmond Rd., St. George, postponed construction of 2 story garage on Castleton Ave. here. $150,000. Architect not announced. Maturity indefinite.

Pa., Arnold—Bd. of Education, C. I. Cotton, Pres., will receive bids until Aug. 4, for the construction of a 2 story, 65 x 120 ft. Junior-Senior High School on Woodmont St. to include shops in basement. Estimated cost $185,000. P. R. L. Hogner, Smithfield Bldg., Pittsburgh, Archt.

R. I., Providence—State Bd. of Public Roads, State Office Bldg., will soon award contract for the construction of a 2 story, 100 x 120 ft. maintenance headquarters building at Okie and Arline Sts. Estimated cost $40,000. Private plans.

R. I., Richmond — Dept. of State Police, Everett St., awarded contract for a 1 and 2 story police barracks and garage. Estimated cost $50,000. Noted July 23.

Pa., Sharon—Standard Oil Co. of Pennsylvania, Peoples Gas Bldg., Pittsburgh, awarded contract for the construction of a garage here. Estimated cost $40,000.

Va., Norfolk—R. A. Burroughs & Co., coppersmiths, plans to construct 2 story brick building, here, to replace one recently destroyed by fire.

Wash., Seattle—Pacific Hoist & Derrick Co., F. R. Schoen, Pres., 818 First St. S., awarded contract for the construction of an 80 x 200 ft. machinery mart at 4th Ave. S. and Hanford St. Estimated cost $60,000.

Wis., Milwaukee—Everbrite Co. Inc., 1440 North 4th St., manufacturers of illuminated advertising signs, has work under way on a 2 story, 50 x 60 ft. addition to factory.

Ont., Toronto—Erie Resister Co. of Canada, R. Reese, Gen. Mgr., subsidiary of Erie Resister Corp. of Erie, Pa., plans the construction of a plant for the manufacture of resisters used by radio manufacturers, here.

Ont., Toronto—Toronto Transportation Comn., 35 Yonge St., Toronto, awarded contract for the construction of a 1 and 2 story, 80 x 100 ft. and 96 x 100 ft. motor coach terminal building on Bay St. Estimated cost $250,000.

Equipment Wanted

Mich., Ann Arbor—University of Michigan—linotype machines, saws, and miscellaneous printing plant equipment for proposed 2 story, 50 x 165 ft. press building.

N. C., Winston-Salem—D-N Corp.—wants catalogues, price lists and samples from manufacturers for ash hoists, fans, blowers, electric motors, cranes, air preheaters, etc.